

*The Medical Society  
from the Author* 3

ON

# PNEUMO-THORAX:

AN ESSAY, READ IN PART

AT THE PHYSICAL SOCIETY OF GUY'S HOSPITAL.

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BY

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AN ESSAY  
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COULD a well-informed physician of the last century again appear upon the stage of active life, and investigate the progress made in pathology since his death, I scarcely know any complaint in which he would find a greater change of opinion to have occurred among well educated medical men, than that which forms the subject of the following observations. Should there be any professor of the healing art now living who entertains a doubt as to the advantages derived from what is commonly called physical diagnosis, combined with the active pursuit of morbid anatomy, in enabling the medical practitioner to arrive at a correct appreciation of certain symptoms, or the medical philosopher at just conclusions as to the nature and origin of certain diseases of the chest, I know not any complaint to which his attention might be directed with greater confidence than to pneumo-thorax. If such an individual will but compare the chapter of the great discoverer of the uses of auscultation, and almost equally great morbid anatomist, upon this subject, with the writings\* of those who preceded him, I think he can no longer continue to feel or to express any doubt upon the matter.

Previously to the investigations of Laennec,

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\* I have endeavoured unsuccessfully, both in Paris and London, to obtain the essay of Itard on Pneumo-thorax.

pneumo-thorax was supposed to arise almost universally either from a secretion of the pleura itself, or from the decomposition of the fluid of empyema, or a suppurating lung. At the present time, all morbid anatomists agree that the gas, in a vast majority of instances, is introduced from without; all assent to the proposition that the secretion of elastic fluid by the pleura and other serous membranes is, to say the least, exceedingly rare; and some, while they deny not the possibility of such an occurrence, express considerable doubt if it ever occurs. "Nothing," says Andral, "is more uncommon than pneumo-thorax produced by exhalation from the pleura\*." In all the cases he had seen, he says in one part of his work, "the existence of the gas in the pleura was the result of the existence of a pulmonary fistula," connecting the cavity of the serous membrane with the bronchial tubes. He subsequently, however, relates a case (No. 21) "presenting the very rare instance of an effusion of gas into the pleura without there being any communication between the cavity of this membrane and the exterior." Laennec recognised the decomposition of albuminous fluids as a cause of pneumo-thorax, and others of the French school of pathologists probably still maintain the correctness

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\* Clinique Médicale, translated by Spillan.



of this opinion. But as far as I have been able to ascertain by a careful perusal of his cases, Laennec appears to have retained it, and even to have considered this origin of the complaint "pretty frequent," simply because in the cases examined after death an opening communicating with the external air was not always discovered. His want of success in attaining this object I cannot but attribute in great measure to his neglect of the only certain mode of arriving at it; viz. the careful inflation of the lungs under water by the aid of the blow-pipe. There are, I believe, but few recent English writers who recognise the decomposition of effused fluids, and of blood, as a cause of pneumo-thorax. I think it indeed doubtful if any British pathologist would, at the present day, be willing to admit, or disposed to maintain, that in the living body such an amount of decomposition of the fluids effused into serous membranes as to give rise to the evolution of gas, can take place without the access of the external air. "It may be laid down as proved," says Dr. Houghton, "that where pneumo-thorax exists the air has been introduced from without; for cases of an opposite description are so rare that they must be considered as exceptions to the rule\*." There is much truth and candour in the following observation of the judicious Chomel. "*Le présence d'une certaine quantité de gaz et de gaz inodores chez tous les sujets qui ont succombé à cette espèce de pleurisie, (viz. from the opening of a tuberculous abscess) l'absence presque constante de ces gaz chez tous ceux qui succombent à une pleurésie ordinaire, doivent porter à croire que dans les cas où la communication du tubercle avec les bronches n'a pas été évidente, elle a pu néanmoins exister. Les médecins accoutumés aux recherches d'anatomie pathologique savent combien elles offrent quelquefois et particulièrement dans des cas de ce genre, je ne dirai pas seulement de difficulté mais d'obscurité et d'incertitude.*"†

But though the views of physicians of the present day as to the nature of pneumo-

thorax are very different from those current half a century ago, and though the very general belief exists among them that the gas is almost universally introduced from without, I have been a good deal surprised in my investigations upon the subject, to observe how various are the opinions of even recent writers upon some points connected with the disease, and how different have been the conclusions arrived at by some pathologists from those which have been deduced from the observations of others. Thus, the late Dr. Andrew Duncan\* believed that "pneumo-thorax was commonly a consequence of empyema, or was preceded by it," while Dr. Houghton expresses an opinion that in a great majority of cases it proceeds from a tubercular cavity bursting into the sac of the pleura. Laennec, again, says that he never saw a patient affected with pneumo-thorax who was not confined to bed (*alité*). Louis, that life, in his experience, has not been protracted beyond thirty-six days, which he evidently regards as a long period. And Andral asserts† "that it generally proves fatal in a very short time, though in some cases the patient has lingered as long as thirty days." How very different has been the experience of many on this side the Channel!!

Dr. Stokes records the case of a gentleman who not only lived for five months after it was proved that he was suffering from this disease, but who improved in health, and increased in flesh during that period, and stated that the only inconvenience to which he was subjected by his complaint was the splashing of the fluid, which occurred while taking exercise on horseback. He also mentions the case of a man who, when suffering more than usual from the accumulation of purulent fluid in the pleura, was accustomed to lie down upon his back and tilt his body by making a purchase with his feet against a wall, and who, by a copious expectoration thereby induced, was enabled to relieve himself from a portion of his inconvenient load. Dr. Houghton had a patient who not merely lived a year after the disease

\* Cyclopædia of Practical Medicine.  
† Dictionnaire de Médecine.

\* Edinburgh Medical and Surgical Journal.  
† Pathological Anatomy, translated by Townsend and West.

was known to exist, but who, notwithstanding the repeated cautions of his physician, would persist in following his employment of bricklaying, and was actually for some time engaged upon a wall near the hospital in which he had been confined. Some who now hear me, or who may subsequently peruse this paper, will probably call to mind the case of a man who, about eight years ago, was in Naaman's Ward of this hospital, who was evidently proud of the splashing noise he could voluntarily produce by shaking his body, and who was delighted by an opportunity of exhibiting to a passing pupil, in his progress down the ward, the phenomena of "Hippocratic succussion." This man, after having been cured of the catarrh for which he was admitted, spontaneously left the hospital, as he felt quite well enough to follow his ordinary occupation. He has not since been heard of at the hospital. Dr. Barlow, in the 4th vol. of the Guy's Hospital Reports, records the case of a young woman who, though weak and delicate during the winter, improved in health, and actually got fat, for three successive summers, and who lived for at least three years with the well-marked signs of pneumo-thorax. This is at once a very remarkable illustration of the very small portion of respirable lung with which life may be supported, and, I believe, the most protracted case of indubitable pneumo-thorax that has yet been recorded.

Seeing, then, that the experience of individuals in this affection has been so different, and has led to conclusions so various, I have thought that a brief general history of the complaint, founded upon cases already published, and especially upon those of which notes have been preserved in the hospital, together with the results of my own personal observation, would not be uninteresting to the members of this Society, and might not be altogether unacceptable to other members of the profession.

"In every case," says a late writer, "in which air, whatever its chemical constitution may be, is contained between the pleura pulmonalis and pleura costalis, the disease is pneumo-thorax." According to this definition, which is, strictly speaking, correct, whenever, in the operation of paracentesis

thoracis, a few bubbles of air pass into the cavity of the pleura, or when an empyema bursts externally, and air supplies the place of a small portion of the fluid which escapes, the case becomes complicated with pneumo-thorax. Such however is not I consider in the present day the ordinary acceptation of the term. Such cases are not generally regarded by either British or foreign pathologists as examples of pneumo-thorax, as it is scarcely credible that Laennec should not have seen persons thus affected who were not confined to bed, or that Louis and Andral should not have witnessed individuals who had suffered from empyema with external fistula, or "open empyema," for months, and even years together. Upon this form of complaint, then, it is not my intention to dilate; such cases are more properly ranged under the term empyema. But as two instances have fallen under my notice, the histories of which were somewhat unusual, and involve considerations of great practical importance, I may, perhaps, be allowed briefly to refer to them.

CASE I.—A woman, aged about 28, came under my care four years ago, as a patient of the Surrey Dispensary. She had the general symptoms of phthisis, hectic, nocturnal perspirations, cough, copious expectoration, great emaciation, debility, and a rapid feeble pulse, and also a discharge from two sinuses in the thoracic parietes on the right side, of which one was below the mamma and the other passed through a portion of the gland. The discharge from one or both of these sinuses alternated with the expectoration; when the one decreased the other increased in proportion. When the discharge from the side was profuse there was little or no expectoration; when the former ceased, or its passage became obstructed, the latter was very abundant. The side was contracted, dull on percussion, and destitute of healthy respiratory murmur. Over a small space below the clavicle alone was heard a little coarse and rough respiration. Tubular breathing and bronchophony existed posteriorly, and fistulous breathing anteriorly and inferiorly. The history which the patient gave of her complaint was, that after her confinement several months ago,



she had a "bad breast," which was poulticed, suppurated, and burst spontaneously; and that very soon after this event she observed air proceed from the opening of the abscess; that she began to cough and expectorate, and had continued to do so, with gradually increasing debility, up to the time I saw her. She was ordered tonics and sedatives, and to continue the poultices to the sinuses. After several weeks, the discharge diminished, and the cough decreased, though her general health improved very slowly, and her debility remained nearly as great as upon my first visit. For the purpose of improving her general health, and that she might not be exposed to the harsh usage of a drunken and dissolute husband, she was now advised to go into the country, and was not seen by me for more than two years. After the lapse of about six and twenty months, a person applied to me at the Dispensary for some trifling stomach complaint. She was stout, sleek, and ruddy, and looked in such really rude health, that I was surprised she required the aid of the doctor. After I had made some inquiry, she said, "You do not recollect me, sir; I am the person you attended in Crosby Row. My husband died, and I have got another, sir, and have had a child, sir, since you saw me." Even after this statement, I could scarcely recognise in her the pallid, emaciated, sickly thing, I had formerly attended. She, however, told me that the discharge, cough, and expectoration, had ceased, and that the wounds had healed, but that she was occasionally troubled with flying pains in the side, and shortness of breath. I much regret that my engagements at the time prevented me instituting an examination of her chest, and that, being unacquainted with her address, I have since had no opportunity of doing so.

CASE II.—Anne Johnson, aged 36, was admitted into Guy's Hospital, Sept. 21, 1841, with cough, expectoration, and discharge from the right side, immediately below the mamma, with all of which she had been troubled for ten months. The history of her complaint, and the symptoms and local signs of her disease, were so similar to those related of the last person, that I consider it quite unnecessary

to detail them. She was occasionally attended by Dr. Barlow and Mr. Cock conjointly with myself. Mr. Cock, while adopting means to ensure a free opening for the discharge of matter, and thereby to favour the collapse and contraction of the side, was able to pass an elastic catheter four or five inches into the chest, and he was inclined to the belief that the cavity from which the discharge proceeded was situated, principally at least, in the lung itself. She continued in the hospital till March 10, 1842, and though little or no progress was made in the cure of her complaint, she left with her general health in no degree diminished by the long-continued drain to which she had been subjected.

Doubts may, I am aware, exist, as to the origin of the disease in these two cases, and a difficulty may be felt in deciding whether the empyema or the mammary abscess was the primary affection; as the information necessary for a correct determination of the question was, in both cases, derived from the patients themselves. After repeated examination in each case, I was myself led to believe that the mammary abscess certainly preceded the affection of the pleura. The late Dr. Andrew Duncan\* mentions a case in which abscesses of the parietes of the chest became emphysematous in consequence of communication with the bronchial tubes, and in which the fluid contents of the abscesses were expectorated through those channels. Thus it appears that though matter may always have a tendency to make its way to the surface, it does not necessarily take the most direct course; and it is clear that even in mammary abscess, as to the desirableness of opening which great diversity of opinion exists, "the line of road may sometimes be marked out" by the surgeon with great advantage to the patient.

#### *Causes of pneumo-thorax.*

Pneumo-thorax may arise from causes exterior to the lung, or from disease or lesion of the organ itself. Among the former set of causes may be mentioned,—

1. The fluid of an empyema bursting

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\* Edin. Med.-Chir. Trans. Vol. i. p. 458.



into a bronchial tube, and the inhalation of air through the opening by which the fluid escaped.

2. Laceration of the pleura costalis, combined with emphysema of the cellular membrane, arising from injury to, or ulceration of, the larynx or trachea.

3. A fistulous communication between some portion of the alimentary canal and the sac of the pleura, and perhaps—

4. Gangrene of the pleura connected with necrosis of a rib.

5. The decomposition of blood, and other albuminous fluids effused into the pleura, and,—

6. The gaseous exhalation of the pleura itself.

Of these the first is by far the most common cause of pneumo-thorax. Of the second I am only acquainted with one example; a case related by Dr. O'Brien in the *Edinburgh Medical and Surgical Journal*, Vol. 18. Of the third I have also met with but one illustration, in a case related by Dr. Stokes. Of the remaining causes in this division it may, I believe, at least be said, in Scottish phrase, that they are "not proven." Of the last, indeed, viz. the gaseous exhalation from the pleura itself, several supposed examples have occurred, during the progress of pneumonia, to some Irish physicians of high repute. I have not myself had an opportunity of witnessing any cases of this kind. I do not, therefore, feel myself qualified to offer an opinion as to the origin of the remarkable phenomena that have been observed; but, from a striking instance mentioned by Dr. Hudson, in the very valuable paper "on typhoid pneumonia," published by him in the *Dublin Journal*, in the year 1835, I think it sufficiently evident that the phenomena observed could not have arisen from pneumo-thorax. The patient, for many hours before her death, had a remarkably tympanitic resonance on percussion, and absence of respiration, similar to that existing in, and supposed to be pathognomonic of, the disease under consideration. These occurred on the side, and in the part previously affording distinct indications of a consolidated lung. She was seen by her physician six hours before her death, and the presence of the

remarkable resonance was at that time verified; but upon inspection of the body after that event, not only was there no air in the pleura, but the lung was found consolidated throughout, and the pleura costalis and pleura pulmonalis *were universally and closely adherent by firm lymph of considerable standing*. I think this case is so well and so distinctly related—the facts are so precise, definite, and unanswerable—as entirely to settle the question of tympanitic resonance and absence of respiration necessarily indicating the presence of gas in the pleura. The hypothesis which Dr. Hudson, in the same paper, very modestly enunciates as a possible explanation of the phenomena observed, viz. that the tensely consolidated lung acts as a conductor to the sound produced by the vibration of the air contained in a large bronchial tube, which it surrounds (an opinion advocated by Dr. C. J. B. Williams, and others), appears to me, upon common acoustic principles, to be decidedly untenable. In the absence of farther and necessary observation, flatulency of the stomach and bowels seems to be the most probable source from which an explanation of the curious and interesting facts is to be derived.

The causes of pneumo-thorax connected with disease, or lesion of the lung itself, are the following:—

1st. The opening of a tubercular excavation into the pleura.

2d. The escape into the pleura of air through softened tubercular matter, communicating with a bronchial tube, but not connected with an excavation.

3d. Gangrene of the lung and pleura.

4th. Laceration of the lung and pleura from external injury.

5th. The bursting of an enlarged pulmonary vesicle from the violence of coughing, in emphysema of the lung.

Of all causes, probably the first of these gives rise the most frequently to pneumo-thorax. It may, however, admit of reasonable doubt whether, in all the cases in which a tubercular excavation is found to communicate with the pleura, the fluid contents of the vomica have passed into the



serous membrane, and thus given rise to pleuritis and emphysema; or whether the fluid of a previously existing pleuritic effusion may not rather have, by its pressure, caused ulceration of the intervening tissues, and thus, by being partially evacuated, have opened a passage for the admission of air—whether, in fact, the coexistence of a vomica, pneumo-thorax, and empyema, necessarily proves that softened tubercular matter has escaped into the pleural cavity.

The second cause above mentioned is probably the next in frequency to that already noticed. The accidental rupture or ulceration of the pleura over tubercles, and the consequent escape of air, sometimes occurs in the earlier periods of phthisis, even before much softening has taken place, and when very few tubercles are deposited in the lung. A curious case\* of this sort is related by Dr. Townsend, in which only a “single nidus,” containing six or seven tubercles, could be discovered in any part of the lung. Andral speaks of a similar example, in which at most six or seven tubercles were found in the lung, one of which, as large as a small nut, was unfortunately situated close to the pleura. Two cases, though of a much less remarkable character, will be hereafter mentioned.

Pneumo-thorax from gangrene of the lung is a rare affection, and though a few cases have been stated to arise from external violence, it is remarkable, considering how comparatively frequent are wounds of the lung from pointed instruments or fractured ribs, and consequent emphysema of the cellular membrane, how uncommon is the complication of pneumo-thorax, as indicated by its ordinary symptoms and physical signs. The only case of pneumo-thorax arising from a rupture of the cells of an emphysematous lung, with which I am acquainted, is mentioned by the late Dr. Thomas Davies†.

In the following table is stated the apparent cause of pneumothorax in sixty-two cases, of which I have either examined the histories as related by others, or which I have myself

witnessed. It may be necessary to state that I have included therein only one case which had not been examined after death; and none which have been barely alluded to, or of which the particulars have not been recorded. I have not, therefore, inserted the singular case of Dr. T. Davies, arising from rupture of the pleura and pulmonary cells in emphysema, or others arising from laceration of the lung. I may also observe, that when phthisis, and especially phthisical cavities, have coexisted with air in the pleura, I have assumed, in the absence of other obvious cause, that the tubercular disease has given rise to lesion of the pleura, allowing the admission of air, even though the aperture through which it had passed had not been detected after death, especially as in some cases scarcely any attempt has been made to discover the opening, and though, as I have already hinted, it may perhaps be doubted whether in some others the vomica has really broken into the pleural sac, or an empyema burst into a tubercular excavation.

*Causes of pneumo-thorax in 62 cases arising independently of external violence:—*

|                                                                                                  |    |
|--------------------------------------------------------------------------------------------------|----|
| Phthisis . . . . .                                                                               | 47 |
| Of these, fluid effusion is also stated to have existed in the pleura in . . . . .               | 27 |
| ———— fluid effusion is not stated to have existed in . . . . .                                   | 17 |
| ———— fluid effusion is stated not to have existed in . . . . .                                   | 3  |
| Empyema . . . . .                                                                                | 8  |
| Gangrene of the lung and pleura . . . . .                                                        | 4  |
| Fistulous communication with the colon through the liver and diaphragm (from hydatids) . . . . . | 1  |
| Uncertain, from being not mentioned 1 ;                                                          | 2  |
| „ not examined 1 ;                                                                               |    |
| Total . . . . .                                                                                  | 62 |

*Symptoms of pneumo-thorax.*

The escape of air into the pleura is said to be indicated by severe and suddenly supervening dyspnoea, pallor of the face, clamminess of the surface, coldness of the extremities, a frequent and fluttering pulse, and other symptoms of general collapse, together with pain of the affected side, and sometimes a sensation of fluid passing into the sac of the pleura. Of the seven cases related by Louis, the general symptoms occurred in all, and in six of the seven they were accompanied with

\* Transactions of the Associated Physicians and Surgeons, Dublin, Vol. 5.

† MED. GAZETTE, Vol. 5.



local pain, while in one only was the sensation of the passage of the fluid experienced. It cannot indeed be denied that the accession of this complaint is in some cases marked by the sudden supervention of such symptoms; but it is assuredly likewise true that pneumo-thorax frequently occurs without them. When, indeed, a person previously suffering from phthisis, or even what is popularly termed "a delicate state of the lungs," is suddenly subjected to such a train of symptoms, and when they are accompanied, or followed by the signs afterwards enumerated, it may be pretty confidently asserted that air has escaped into the pleura. But from the observations of others, as well as myself, I may assert with equal confidence that pneumo-thorax may exist without any circumstances having been observed by the patient or his friends by which the exact period of its formation could be indicated. In support of this opinion, I may refer to cases by Drs. Stokes, Townsend, Houghton, Barlow, and others, as well as to some of those to be subsequently detailed in this paper.

The general symptoms of pneumo-thorax, independently of those supposed to mark the period of its supervention, are neither very remarkable nor characteristic. They are hurried respiration, decubitus on the affected side, pallor of the face, an anxious expression of countenance, a small, feeble, and frequent pulse, cough, with more or less expectoration, and sometimes febrile excitement and pain of the side. Even if these symptoms were constant, they possess nothing of a distinctive character. But they are not collectively always present. Thus, though the favourite position of the patient is usually one considerably inclined to the diseased side, some lie indifferently upon either side, or upon the back, without increased distress or inconvenience. Though the cough is sometimes pretty frequent, it is occasionally so trifling and rare as altogether to escape the notice of the observer; and if previously troublesome, it sometimes decreases very perceptibly to the patient after the occurrence of the accident. Pleuritis and its accompanying pain and fever are sometimes occasioned by the escape of gas and tubercular matter, but it is either not a necessary result

of the lesion, or is occasionally so slight as to escape observation.

But if the general symptoms are not distinctive, the physical signs are such as are not easily mistaken. They are, tympanitic resonance on percussion, and absence of respiration; imperfect elevation, or immobility of the ribs, and more or less enlargement, or altered configuration of one side of the chest; partial displacement of the heart and diaphragm; amphoric breathing, metallic tinkling, metallic resonance of the voice, and cough; and, if fluid likewise exist in the pleural cavity, Hippocratic succussion.

I do not think it necessary or desirable that each of these symptoms should be separately examined and discussed; but I feel that I am called upon, or at least that I am fairly entitled, without a charge of prolixity, briefly to state the result of my own experience in reference to several of them.

*Tympanitic resonance on percussion, and absence of respiration*, have been by some regarded as almost pathognomonic of pneumo-thorax. This opinion is certainly founded upon insufficient evidence, as I have myself seen more than one case in which the side, as a whole, was dull rather than resonant upon percussion, and in which, even locally, it was not more resonant than natural. I also several times examined one patient in whom the whole of the side was obviously, decidedly, and incontrovertibly, dull on percussion, but in whom the other indications of the presence of pneumo-thorax were at the same time well marked during life, and in whom the existence of the disease was verified by inspection of the body after death. I have also seen tympanitic resonance on percussion, and absence of respiration, in nearly the whole of one side, produced by the co-existence of a firm, airless, and contracted lung, and of a stomach largely distended with gas passing high above its ordinary level; and I feel assured that one at least of my colleagues at the hospital can bear testimony to the doubts and difficulties which may arise from this cause. The cases also of pneumonia, accompanied with tympanitic resonance, such as have been related by others, but, as I have previously acknowledged, have never been witnessed by my-



self, might likewise be advanced against the pathognomonic character of these signs. Occasionally also the lung is so bound down to the diaphragm and pleura costalis by old pleuritic adhesions as not to be removed by the subsequent effusion, and thus to admit, at some parts, of a little hoarse and indistinct respiratory murmur, which might render the existence of the complaint doubtful to those by whom *absence of respiration* is considered as its almost necessary accompaniment.

*Immobility of the side, or imperfect elevation of the ribs*, is almost constantly present; but enlargement of the side, and partial dislocation of the heart and diaphragm, are far from being universal attendants upon pneumo-thorax. In some cases the shape and size of the affected side of the chest is unchanged, in others it is misshapen, contracted, and smaller than the opposite side, in consequence of old pleurisy.

*Amphoric breathing, metallic tinkling, metallic resonance of the cough and voice.*—The whole of these signs depend upon the shape and size of the aperture in the pleura, and the size and lining of the cavity into which it leads. Arising from the reverberation or echo of the vibrations producing the common sounds of tubular breathing, of the cough and the voice, they are necessarily modified by the circumstances which give rise to that reverberation, and become more or less distinct, and even disappear altogether, and re-appear, according as the cavity is large or small, or is more or less occupied by liquid effusion. Thus the common fistulous breathing which is present when a cavity is of small or of moderate size, acquires a metallic ringing character when the cavity is large. When a portion of mucus or of membrane partially obstructs the opening, or when a drop of bronchial secretions falls into the fluid effused, or again when the opening into the pleura is situated below the level of the fluid, and bubbles of air pass through it, and burst upon its surface, the curious phenomena of metallic tinkling are produced—a sound which, in its most perfect form, more nearly approaches to that caused by shaking a pin in a large bottle or decanter, than any other with which I

am acquainted. When both the cavity and the opening are large, the sound resembles that produced by blowing into a large wide-mouthed bottle, and constitutes amphoric breathing—"bourdonnement amphorique," or "utricular buzzing."

For the production of *Hippocratic succussion*, a large cavity and the presence of both air and fluid are necessary. It is the noise caused by the splashing of fluid in a confined space. It is heard only when the fluid exists in a quantity, considerable indeed, but not so large as nearly to fill the cavity and thereby exclude a necessary amount of air—little sound is produced by shaking a bottle which contains either a few drops only of fluid, or so much as nearly to reach the cork. Hippocratic succussion may be generally easily elicited in the following way, which, I think, causes less inconvenience to the patient than either getting an assistant to shake him by the shoulders, as originally recommended, or requesting the invalid to give a twist or jerk to his own body, as recently advised. Press the ear firmly against the part of a chest in which the sound is most distinct; grasp the body of the patient with one arm, then smartly swing both body and head to and fro, and suddenly stop the motion. By these means, undulations are caused in the fluid without violent agitation, and generally, if not too long continued, without any distress, fatigue, or inconvenience to the invalid.

*Theory of the difference of Symptoms and Physical Signs of Pneumo-thorax.*—I am induced to say a few words upon this subject, as it has appeared to me that the great variety in the continuance and severity of the symptoms, obviously in a great measure dependent upon the different physical conditions under which pneumo-thorax occurs, has not been hitherto sufficiently noticed, and that a more strict attention to, and just appreciation of, the diversified conditions of the organs in which it takes place, are necessary to a correct view of its pathological history.

If, between a bronchial tube and the sac of the pleura, a communication were made through which the external air was freely



admitted into its cavity, and if the lung and pleura were both free from disease, the first effect of the operation would be a certain amount of collapse of the lung—the result of its proper elasticity. If, then, the ingress and egress of air to and from the pleura continued free, the lung, in consequence of the greater facility with which the air passed into the pleura, would be, as a whole, but little expanded upon inspiration, and that portion of it to which the injured bronchial tube was distributed, would not be expanded at all. Less blood would be sent to the organ, its functional activity would decrease, its size would be gradually diminished, and air accumulating in the pleura would slowly occupy the space. If, on the contrary, while the ingress of air to the pleura took place with facility, its egress therefrom were prevented, or effected with difficulty, in consequence of some obstruction—if, at each inspiration, air passed into the sac of the serous membrane, and its escape during expiration were, in great measure, prevented either by the situation or form of the aperture—it is evident that the complete collapse of the lung would be greatly accelerated, and that the distress experienced by the patient would *cæteris paribus* be proportionably great. If, however, a great part of the lung were already so diseased as not to admit of expansion—if a considerable portion were occupied by cavities, or consolidated, in consequence of pneumonia or tubercular deposit—or if it were in some parts already closely adherent to the diaphragm or pleura costalis, through former pleuritis—then it is clear that not only would there be less lung capable of being collapsed, and therefore that, other circumstances being equal, the alteration in the circulation and aeration of the blood would be necessarily less extensive, but also that the collapse of that portion which was still crepitant and expansible would be in some measure prevented by the diseased parts by which it was surrounded. The air escaping, under such circumstances, into the space of the pleura which was not adherent, would be limited in quantity; the extent of pulmonary tissue thereby rendered incapable of respiration would be comparatively small;

the general distress resulting therefrom might be naturally expected to be comparatively trifling, and the physical signs would almost necessarily be less salient and characteristic. Now, I would ask, do not such diversified conditions really exist? Is it not true that pneumo-thorax may and does occur when very little disease exists in the lung, as well as when the organ is consolidated, riddled with cavities, or adherent nearly in every part; that the symptoms vary much in severity and duration, from distressing and alarming collapse, terminating in death after a very few hours, to the very chronic and scarcely observable affection, the approach of which has been unnoticed, and the duration of which extends over weeks and months, and even years? Is it not perfectly intelligible, upon the theoretical grounds that I have stated, that the accident which is the cause of speedy death to one should pass almost without notice in another individual\*? I have reason to believe that pneumo-thorax exists in the latter stages of phthisis much more frequently than has been hitherto supposed, and that it is not recognized, from the simple fact of its not being accompanied with any peculiar symptoms.

If, again, a person distressed by the accumulation of the fluid of a simple empyema have a portion of that fluid removed through a natural opening into one or more bronchial tubes,—if, in fact, the operation of paracentesis be performed internally, and the air, which sometimes passes into the pleura in consequence of more fluid having been evacuated by coughing, and more space left in the serous cavity than can be closed by the defective resiliency of the ribs, or the imperfect expansibility of the lung, have free egress as well as ingress through a large opening,—then after the immediate effects of the operation have ceased, and the fear of suffocation arising from the ejection of a large quantity of fluid has passed away, the patient will, in all probability, be relieved, and in reality very frequently is relieved, by the accident.

In confirmation of, or rather in addition

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\* Since this was written and read, I have perused the clinical lecture of Dr. Barker on a case in St. Thomas's Hospital, curiously confirmatory of the observations made above.



to what has been here stated, it has been suggested to me by my friend and colleague, Dr. Rees, that, as when a part of an organ, or if there be two, when one organ is rendered incapable of action by accident or disease, another part of the same organ, or its fellow, assumes a supplementary action, and thus in some measure, compensates for the deficiency thereby induced, as is frequently seen in pneumonia, and particularly in disease of one kidney; so the more extensive has been the previous disease of the affected lung in pneumo-thorax, the larger has been the supply of blood, and the greater consequently the functional activity of the opposite lung, and therefore that not only is less blood sent to it in addition to that which it had before received, but that it is already in a condition better fitted to receive it.

I believe, indeed, that it will be generally found that *cæteris paribus* the less diseased the lung, and the smaller, within certain limits, the opening into the pleura, the greater will be the distress on the occurrence of pneumo-thorax, and conversely, the more diseased the lung, the greater the extent of pleuritic adhesions, and the larger the opening, the less will be the anxiety and collapse after that accident.

I am not prepared to assert that this will be found universally true; but I can certainly state that in many cases where the symptoms have been very severe and well marked, and the disease has been rapidly fatal, there has been found comparatively little disease of the lung itself, and the opening into the pleura has been small or not discovered; and conversely, that where the accession of the complaint has been unnoticed, or indicated by slight symptoms; and the disease has continued for many months, extensive disorganization of the pulmonary tissue, which had pretty evidently existed previously to the accident, has been discovered after death. Dr. Townsend's case, and two which will be subsequently related, may be advanced in confirmation of the one position, and Dr. Stokes', Dr. Houghton's, Dr. Barlow's, and some cases appended to this paper, may be quoted in support of the other.

This leads me to say a very few words on

the appearances presented by the opening into the pleura, the especial morbid anatomy of the affection. If no fluid escape from the lung at the time of the rupture, pleuritis does not necessarily follow, or the patient may die previously to its occurrence. When, as most commonly happens, pneumo-thorax arises from the bursting of a phthisical cavity, it is usually followed by pleuritis and effusion. The aperture is then generally situated in the upper lobe, or, as stated by Dr. Houghton, at the lower edge of the upper lobe, immediately below the thick pleuritic cap, or coating, which so frequently covers the apex of the lung in phthisis. The opening, as I have previously noticed, is sometimes so small, or so covered with albuminous matter, as not to be seen after even minute examination, and can only be discovered by the use of the blow-pipe, which rarely, and as far as I have hitherto observed, never, fails to disclose it. When the accident occurs, as in two examples to be afterwards mentioned, in cases of diffused phthisis without cavities, the aperture may exist in any part of the lung, as every part is almost similarly affected. I have seen one case, in which, though cavities existed at the apex, the aperture in the pleura was found in the inferior acute edge of the lung. After the disease has lasted for some time the opening sometimes increases in size, and its edges become rounded and obtuse. In Dr. Houghton's very interesting case in the Dublin Journal, there were several openings, one or more of which appeared to him to be undergoing a process of contraction, which might subsequently have led to their obliteration.

When pneumo-thorax exists as a complication to empyema, the opening into the pleura is occasionally large, and appears as if lacerated; more frequently, however, there are many minute cribriform openings, by which the sero-purulent fluid oozes through the membrane into several bronchial tubes.

When pneumo-thorax arises from gangrene of the lung and pleura, the openings are irregular and undefined, but generally large, loose, and flocculent.

*The diagnosis of pneumo-thorax*, with the aid of auscultation, percussion, and succussion, has usually been represented to be an



affair of great simplicity, and when the entire progress of any case has been witnessed by any one observer, when the accession and the whole of the ordinary phenomena of the affection are well defined, when, in fact, pneumo-thorax exists as it is usually described in books, a very simple affair it is. But every really practical and observant physician is aware that at the sick man's side doubts and difficulties will occasionally arise, even in those diseases which upon paper are represented in characters apparently so clear as not to be mistaken. The diseases, or conditions with which pneumo-thorax may conjecturally be confounded, are—1st, emphysema of the lung; 2dly, the tympanitic resonance said to occur during the progress of pneumonia; 3dly, a flatulent stomach overlaid by a consolidated lung; and 4thly, phthisical cavities. Of the two first I shall say nothing. The former of the two I have, indeed, mentioned only because it has been customary to do so, as I believe that with moderate attention to the history, symptoms, and physical signs, it is scarcely possible that a mistake can arise. Of the latter of the two I forbear to speak, because I can say nothing derived from my own experience, unless indeed, as I already expressed my conviction, it may be referred to the third condition mentioned; viz. a stomach distended with gas, and overlaid by a solid and contracted lung. In this combination the absence of respiration and the tympanitic resonance on percussion are often complete, and succussion occasionally exists. The side is contracted indeed, but sometimes, though rarely, it is likewise so in pneumo-thorax. The ribs are but slightly elevated, or almost motionless, and I believe that in a few rare examples the only circumstances upon which we can rely for the diagnosis of the two affections are the fistulous, metallic, or amphoric breathing, and the metallic ringing of the voice, and cough, which are constantly present in the one affection, the want of completeness, uniformity, and consistency in symptoms and signs of the other, and the history of the respective cases.

But of all diseases a large phthisical cavity is by far the most liable to be confounded with, and the most difficult to be diagnosti-

cated from, pneumo-thorax. I lately saw a case examined in the hospital, in which one immense cavern occupied the whole of the left lung, and in which, even after death, it was for some time difficult to decide whether the cavity was in the pleura or the lung itself. In such a case, excepting the history, I know of no circumstance whatever upon which a diagnosis could be formed, with even tolerable certainty. A few years since there was an elderly woman in the hospital, in whom all the facts of the history, the symptoms, and physical signs, led to the supposition of the existence of pneumo-thorax, with the single exception of the cavern being situated at the upper third of the lung. Upon inspection after death, a very large and old vomica was found, with firm and hard parietes, and nearly all the remainder of the lung dry, tough, and airless. In another case examined last year, a circumscribed pneumo-thorax, of the size and shape of a foetal head, existed in the left mammary region, which presented all the physical characters of a large vomica. I lately attended a young medical man, during whose last illness I had once the advantage of meeting a physician of considerable reputation as an auscultator. The disease had been pneumonia, supervening, as I believed, upon chronic tubercular disease of the lung, and terminating in rapid phthisis. In the left mammary region there was evidently a large cavity, indicated by tympanitic resonance on percussion, amphoric breathing, and metallic resonance of the voice. The accomplished physician referred to expressed his belief that pneumo-thorax existed. I differed from him in this opinion; but I was induced to do so only because, having had the advantage of watching the case throughout, I had observed the consolidated lung to soften down; the cavity to appear and gradually to enlarge, and because the sputa for several weeks had been those of advanced phthisis, excepting when temporarily increased by a passing attack of bronchitis. The body was not examined after death.

A phthisical cavity, indeed, may be accompanied with all the symptoms and auscultatory signs of pneumo-thorax, and

pneumo-thorax by those only of a phthisical cavity. The diagnosis in a vast majority of cases may, notwithstanding, be effected with facility, and in circumstances of difficulty may be assisted by the following considerations. In simple phthisis, the tympanitic resonance, and the metallic tinkling (not common in any degree), is very rarely so well marked as in pneumo-thorax, while succussion is so very unfrequent in the former, as never with certainty to have been heard by myself, or as far as my knowledge extends, by any one with whom I am acquainted. Laennec is reported to have heard it on one occasion. In pneumo-thorax the chest is *generally* enlarged; in simple phthisis almost always contracted. In the former affection the patient usually lies on the affected side; in the latter upon either side, or upon the back indifferently. In pneumo-thorax the cavity is commonly at the lower part of the chest; in simple phthisis the chief excavation is almost universally at the upper part.

On the *prognosis* of pneumo-thorax I need say nothing, as I believe in all cases hitherto noticed it has proved ultimately fatal; unless, indeed, the case first related in this paper may be regarded as an example to the contrary. The varying duration of the complaint will be best estimated by a portion of the following brief view of the statistics of sixty-two cases. Nearly half of these have either fallen under my own notice or are recorded in the hospital books; the remainder have been collected from the writings of modern authors, and have in all instances been examined by myself.

Of sixty-two cases of pneumo-thorax there were—

|                 |       |
|-----------------|-------|
| Males . . . .   | 48    |
| Females . . . . | 14—62 |

The left side was affected in—

|                 |     |    |
|-----------------|-----|----|
| Males . . . .   | 28} | 36 |
| Females . . . . | 8}  |    |

The right side was affected in—

|                 |     |    |
|-----------------|-----|----|
| Males . . . .   | 20} | 26 |
| Females . . . . | 6}  |    |

—  
62  
—

The age of the patients was under 20 in—

|                |    |   |
|----------------|----|---|
| Males . . . .  | 8} | 9 |
| Female . . . . | 1} |   |

The age of the patients was 20, and below 30, in—

|                 |     |    |
|-----------------|-----|----|
| Males . . . .   | 19} | 26 |
| Females . . . . | 7}  |    |

The age of the patients was 30, and below 40, in—

|                 |     |    |
|-----------------|-----|----|
| Males . . . .   | 11} | 16 |
| Females . . . . | 5}  |    |

The age of the patients was 40, and under 50, in—

|                |    |   |
|----------------|----|---|
| Males . . . .  | 6} | 7 |
| Female . . . . | 1} |   |

The age of the patients was above 50, in—

|                   |         |   |
|-------------------|---------|---|
| Males . . . .     | 3}      | 4 |
| Was not mentioned | 1 male. |   |

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62  
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As the statements concerning the duration of life in the sixty-two individuals whose histories I have examined, were in many instances very indefinite, while in some others, in consequence of the uncertainty connected with the accessory period, it was not possible that it could be determined, the following table is necessarily very defective. I have, however, endeavoured in each case where it was possible to calculate the period exactly, and whenever the duration of the complaint was not to be distinctly ascertained, I have called it “uncertain,” or “unrecorded.”

Duration of life in sixty-two cases of pneumo-thorax:—

|                                                       |    |
|-------------------------------------------------------|----|
| “A few hours” . . . .                                 | 3  |
| Less than twelve hours . . . .                        | 2  |
| Twelve hours, and less than forty-eight hours . . . . | 4  |
| Forty-eight hours, and less than one week . . . .     | 10 |
| “Some,” “several,” or “many” weeks . . . .            | 5  |
| One week, and less than one month . . . .             | 4  |
| One month, and less than three months . . . .         | 5  |
| Three months, and less than one year . . . .          | 8  |
| Twelve months (at least, Dr. Houghton) . . . .        | 1  |
| Thirteen months (Dr. Stokes) . . . .                  | 1  |
| Three years (at least, Dr. Barlow) . . . .            | 1  |
| Uncertain, or unrecorded . . . .                      | 18 |

—  
62  
—

*The treatment of pneumo-thorax.*—I have little to say—indeed, I believe there is little to be profitably said—upon this part of my subject, as little can be advanced in reference



to the means of affording temporary relief except what is necessarily general, and as, according to all known experience, no specific plan of treatment can be recommended with a prospect of effecting a permanent cure. Symptoms are to be met as they arise. Gentle means are to be employed for their mitigation or removal. Quiet, stimulants, and nutritious food, or sedatives and even antiphlogistics, general or local, may be required in the ever varying circumstances of each case. No rules can be consistently laid down. No plan of treatment can be with propriety prescribed as universally or even generally applicable.

The only questions, indeed, which admit of discussion, are the necessity, the propriety, and the time of performing the operation of paracentesis.

The opinions, or at least the practice, of almost all modern physicians, appear very nearly to coincide upon these points, and the belief seems now to be common that, excepting for the purpose of affording relief to the distressing dyspnœa, paracentesis is not to be recommended in pneumo-thorax.

In the tables published by the late Dr. Davis, of twenty-nine cases in which paracentesis was performed, the following were the results :—

|                  |              |         |
|------------------|--------------|---------|
| 16 empyema . .   | 12 recovered | 4 died. |
| 9 pneumo-thorax  | none . .     | 9 died. |
| 4 hydro-thorax . | none . .     | 4 died. |

Among the cases which constitute the table from which the previous numbers as to age, &c., have been taken, I find that of seven only it is stated that paracentesis was performed.

Of these—

- 1 died four hours after the operation, and was thereby not relieved.
- 1 died twenty-four hours after, not relieved.
- 1 died forty hours after, not relieved.
- 1 died sixty hours after, relieved.
- 1 died six days after, relieved.
- 1 died twelve days after, not relieved.
- 1 died sixteen days after, relieved.

From these facts, together with those previously mentioned from Dr. Davis, it appears evident that the operation of paracentesis affords not any prospect of effecting a

cure of pneumo-thorax, and that in many cases experience warrants but little hope of its affording even temporary relief. When, indeed, it is recollected that in numerous examples the egress of the gas remains perfectly free, it appears difficult to understand upon what intelligible principle the operation, at least in such cases, can be recommended with even a fair prospect of success. A free opening already existing, I must confess my own inability to comprehend why another should be required. There are, however, three conditions under which I imagine it may possibly be advantageous to perform paracentesis in pneumo-thorax. First, when the accession of the complaint is marked by great anxiety and general distress, arising from excessive dyspnœa; secondly, when, after a considerable duration of the complaint, gradually increasing dyspnœa supervenes, in consequence of the egress of the air being prevented or obstructed by an accidental fold of membrane, plastic pleuritic effusion, or bronchial secretion; and thirdly, when fluid effusion is added to the other effects of the accident, and accumulates in such quantity as materially to embarrass the respiration, and thus increase the distress already existing. In these circumstances, as purulent, or sero-purulent fluid, may require a dependent opening for its exit, the operation may be fairly expected to be followed by temporary benefit.

We may perhaps be allowed hence to state the general law, that in pneumo-thorax proceeding from disease, and not from external injury, the operation of paracentesis offers little prospect of advantage, and is therefore not to be recommended, except for the purpose of relieving urgent symptoms of dyspnœa and anxiety, caused by the accumulation of gas or of sero-purulent fluid.

Much, however, may be done in many instances, as I know by experience, to render the life of the patient easy, and even tolerably comfortable. The *juvantia* and *lædentia* cannot be here specified, as they will necessarily vary more or less with the particular circumstances of each case. Stimulants may be here required, and sedatives may be beneficially prescribed there; but in almost all cases, though we may have the sad con-



viction that our best-directed efforts cannot save or permanently restore our patient, we may possess the melancholy gratification of contributing, by kindness, by attention to position and diet, and the judicious administration of medicine, to mitigate his sufferings, or to relieve his pain, and thus to procure for him a tolerably quiet and moderately comfortable existence. "Proud science," says Dr. Houghton, with much feeling eloquence, "may draw back from what seems to be beyond her realm; but the physician has higher instincts to obey and duties to perform here, as in other hopeless diseases, in attempting even the mitigation of the pain and anguish which science tells him he cannot altogether remove; and this reflection may be added, that where such motives actuate him to exertion, he is seldom left entirely without the satisfaction which obedience to them brings."

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I proceed now to relate a few of the cases which I have seen, and of which I have fortunately preserved or obtained notes.

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CASE III.\*—*Diffused Phthisis—A single small cavity—Pneumo-thorax—Opening not discovered—Death in thirty-four hours.*

C. A., aged 22, a weak and delicate-looking woman, of light complexion, came under my care as a patient at the Surrey Dispensary, July 20th, 1839. She resided at Lambeth, was occupied as a sempstress, and had been troubled with weakness and pain of the back for some years, and had attended as an out-patient at Guy's Hospital in consequence. She had not, however, been troubled with cough of any severity or constancy till three weeks before I saw her. She had never suffered from hæmoptysis. Her father was dead; she had a mother, and some brothers and sisters, in good health. At my visit I found her in bed, very feeble, pallid, and nervous. She complained of cough, with tightness of the chest, and rather copious mucous expectoration; the tongue was pale,

clean, and moist; the pulse small, feeble, and very frequent; the catamenia irregular, and accompanied with pain. She was so excitable as to prevent any useful examination of the chest by either percussion or auscultation. But from the imperfect exploration I was enabled to make, I believe the signs were those of bronchitis. If phthisis existed at all, the tubercles were generally diffused throughout the lungs. She was at first treated with expectorants and counter-irritants, and subsequently with emetics, and iodine combined with sedatives, and improved so much in a week or two as to take tonics with obvious advantage. About the end of September she had a fresh attack of bronchitis, with considerable febrile excitement. I now thought it necessary to apply a few leeches below the clavicles, and to follow them with a blister to the sternum, and to administer small and repeated doses of antimony, blue pill, and opium. The soreness of the chest was thereby considerably lessened; the cough, however, continued, and her debility was advancing; the pulse, always rapid, had increased in frequency, and emaciation of the face and limbs was perceptible and progressive. In the middle of the night of October the 9th, after a day passed as well as, or rather better than usual, she had a fit of coughing, remarkable neither for its violence nor its duration, which was immediately followed by excessive dyspnoea, accompanied with pallor of the face, clamminess of the surface, and other evidences of collapse, and also *with flatulence of the stomach and bowels, but without pain*. She continued in this state till I saw her twelve hours after, when I found her lying on the right side; the face and body bedewed with clammy perspiration; the extremities cold; the respiration hurried and anxious, and the pulse excessively feeble and rapid. Any attempt at moving the body appeared to add to her distress, and to endanger her life so much that no efficient examination of her chest could be made, and the only facts ascertained as to its condition were, that the right side was very resonant on percussion, and that the resonance extended behind the sternum. She had no cough, but was still troubled with flatulence. Sinapisms were ordered to be applied to the *scrobic. cordis*

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\* Cases 3 and 4 have been previously published by me in the "Reports of Cases" in the MEDICAL GAZETTE.



and to the feet, and ammonia and brandy to be administered internally, but they produced no effect. She never rallied from the state of collapse, and expired at 10 A.M. the next morning, about thirty-four hours after the accident.

*Inspection 24 hours after death, kindly performed in my absence by Mr. Nettlefold and an assistant.*—The head was not opened. On removing the sternum, air escaped with a hissing noise from the right pleura. The lung was reduced to one-fourth its ordinary size, and adhered superiorly to the pleura costalis. It was studded in every part with miliary tubercles, which appeared to have softened in no other situation than in the mammary region, in which existed, close to the surface, a cavity the size of a nutmeg. The pleura was filled with air alone, contained no liquid effusion, and presented no evidence of recent inflammation. The mediastinum and its contents were pushed much to the left side. No aperture was discovered in the pleura, but the lung was not inflated by the blow-pipe. On the left side the lung was greatly congested, and sprinkled with tubercles, which were generally immature, but were in some parts just beginning to soften. The heart was small and flabby. The abdomen was not examined.

This case presents a very fair example of the effects of pneumo-thorax occurring from a lung not extensively diseased, and causing therefore a sudden and almost total arrest of the circulation in one-half of the respiratory organs. The rush of gas which occurred on opening the chest, together with the pressure of the mediastinum to the left side, appears to indicate that the air, after the collapse of the lung arising from its own elasticity, entered in larger quantity, or with greater facility, than it escaped from the pleura, if indeed during life it escaped at all, and renders it probable therefore that some transient relief at least might have been afforded by paracentesis, which I have ever since lamented was not in this instance performed. The absence of pain, and all indications of pleuritis, the single and small cavity near the surface of the lung, and the complaint of great flatulence of the stomach and intestines, are also worthy of notice, as it has

been supposed by some that pleuritis and consequent pain are among the almost necessary results of the accident, and as I do not remember to have observed that flatulence has been a prominent symptom in other cases.

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CASE IV.\*—*Diffused phthisis—No cavity—Pneumothorax—Opening not discovered—Death in ten hours.*

A very fine young gentleman, aged 19, of light complexion, whose father and mother were alive and in good health, but one of whose brothers had died from phthisis, was suddenly attacked with hæmoptysis without any previous cough, or other assignable cause. After a fortnight he became apparently convalescent, and went to the sea-side for change of air. When he had been there for three weeks, and while he was apparently without complaint, he was suddenly attacked with extreme dyspnœa, and died in about ten hours.

*Inspection, 24 hours after death.*—Percussion elicited a remarkably clear sound on the left side of the chest, while the right side was dull, particularly posteriorly. The head was not opened.—*Chest*: On dividing the cartilage of the fifth rib on the left side, gas escaped with a wheezing noise. Two-thirds of the left side were filled with air, the remaining third being occupied by the collapsed lung, the upper lobe of which was adherent to the pleura costalis by old and firm cellular membrane. In every other respect the pleura appeared healthy. The left lung was throughout sprinkled with tubercles, some of which, close to the surface, caused elevations to appear on the pleura pulmonalis, but none were observed to have formed a cavity, or to have caused ulceration of the serous membrane. No aperture in the pleura was in fact discovered, but the lung was not inflated. The right pleura pulmonalis was firmly adherent to the pleura costalis and pericardium. The apex of the right lung contained some immature tubercles. The two inferior lobes were simply

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\* This case was not seen by myself, but was communicated to me by Mr. Nettlefold, who examined the body, and is introduced here as a rather remarkable example of the complaint.



congested. The pericardium was firmly adherent to the sternum and to the pleura covering the cartilages of the ribs on the right side and the right lung, and, together with the heart, was pushed upwards and to the right. The pericardium contained rather more fluid than usual, and the heart was flabby and thin. The state of the abdominal viscera was not recorded, if examined.

The only observation that I think it necessary to make upon this case, as the history and symptoms are so defective, is, that it affords another illustration of the severe distress and rapid death occurring after the escape of air into the pleura in cases where little, comparatively little, disease exists in the lung, and where, from the opening not having been discovered, it may be fairly presumed, I think, to have been small—a severity and rapidity, however, which, in this instance, was probably materially augmented by the curious adhesion of the pericardium to the sternum and costal pleura.

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CASE V.—*Phthisis—Empyema—Pneumothorax—Dulness on percussion—Death in about ten weeks.*

Thomas Davies, aged 28, a tall, thin labourer, of light complexion, was admitted into Guy's Hospital, under the care of Dr. Back, September 18th, 1839. After having suffered from cough, and the general symptoms of phthisis, for some weeks, he was about two months previously to his admission attacked with severe dyspnoea and general distress without pain which caused him to desist from his work, and go home to bed. On admission he lay somewhat inclined to the right side, which was not elevated during inspiration, and which to the eye appeared, but upon admeasurement was not found to be, larger than the left. Dulness on percussion existed in the whole of the right side, except just below the clavicle, where the resonance was not greater than natural. In this situation, and close to the dorsal spine alone was heard some bronchial respiration mixed with mucous rattles. In other parts of this side the breathing was strikingly amphoric, and was occasionally accompanied with metallic tinkling. A

splashing noise (Hippocratic succussion) was easily produced by any sudden motion of the body. His breathing was not much accelerated, nor was he much troubled with cough; but his pulse was always rapid and feeble. On turning to the left side he expectorated large quantities of sero-purulent fluid. On the left side below the clavicle were heard gurgling and pectoriloquism; the other parts of this lung appeared comparatively free from disease. He lingered in this state about three weeks without any remarkable change of symptoms, excepting that he got gradually weaker, and his lower extremities became oedematous. He died Oct. 8, 1839.

*Inspectio Cadaveris.*—The head was not opened.—*Chest*: the right pleura was much thickened, covered with a soft, flocculent, albuminous deposit, and contained about forty ounces of thick cream-like purulent fluid. The remainder of this side of the chest, not occupied by the greatly compressed lung, was filled with air, which was, however, not in large quantity, as the mediastinum was not displaced. The lung was superiorly adherent to the pleura costalis, reduced to about one-third its ordinary size, and contained several small vomicæ, and tubercles distributed throughout nearly its whole extent. Four of these vomicæ were situated near the surface, and two of them—one the size of a pea—the other as large as a hedge-nut—communicated through considerable openings with the pleural cavity. The left lung was also adherent superiorly to the pleura costalis, and contained several small vomicæ, surrounded by pneumonic consolidation. The bronchial tubes of both lungs contained much purulent fluid; and the larger branches were considerably injected, and slightly granular. The pericardium was healthy. The heart was much dilated, flabby, and thin. This was especially remarkable in the right ventricle, which contained several rounded masses of fibrine, “globular fibrinous concretions,” most of which were not larger than peas or small beans, and were lodged in the depressions of the muscoli pectinati, but one of which, situated in the apex, was as large as a walnut. Its external surface, smooth at some parts,



and at others sending off prolongations, which interlaced with the muscular bands, was in contact with, but not adherent to, a mass of coagulated blood. Its walls were about one-eighth of an inch thick, soft, dull, and opaque. It was filled with an opaque albuminous fluid, having the appearances of pus, but which, though not examined microscopically, I believe, as I have already expressed my conviction in reference to similar cases, to have been merely softened or broken-down fibrine.—*Abdomen*: The liver was large, turgid, and myristicate. The kidneys were also large, and congested. The spleen, pancreas, stomach, and intestines, were not observed to be diseased.

The circumstances in this case particularly worthy of notice are, in the first place, the co-existence of dulness on percussion with most of the other physical signs of pneumothorax. This, which I had myself an opportunity of verifying on several occasions, was sufficiently explained after death by the considerable quantity of semi-solid and fluid effusion in the pleura, by the complete collapse of the lung being prevented by the tubercular deposit which it contained, and by the *accumulation* of air being prevented by its free egress through two openings of considerable size. In the second place I may remark that it is at least a curious coincidence, that in this, and in a case to be subsequently related, a well-marked fibrinous concretion, of considerable standing, was found in the apex of the right ventricle; the situation in which, in consequence of the obstruction to the flow of blood through the lungs, the delay would be the greatest. This obstruction causing delay, together with great prostration of the power of the patient, and consequent feeble action of the heart, as has been already stated in a paper on “Fibrinous Concretions in the Heart,” in the Guy’s Hospital Reports, is probably the principal, if not the sole, cause of the formation of that modification of these bodies which was observed in the case under review.

For a record of the following case I am indebted to the notes of Dr. Grant, Staff-

Surgeon 2nd Class, formerly in charge of the Military Depôt at Maidstone, and now in India; and to the kind assistance of Mr. Prance, Surgeon, of Maidstone, with whom, together with Dr. Sebbald of that town, I had an opportunity of exploring the chest of the patient, and of verifying all the principal symptoms and physical signs. Dr. Grant’s notes are very long. I have taken the liberty of condensing them considerably.

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CASE VI. — *Phthisis — Pneumothorax — Empyema*—*No symptoms indicating the accession of the complaint — Extensive tubercular deposit — Death in about two months.*

Wm. Moran, aged 18, of spare habit and scrofulous diathesis, a private and bandman, blowing the opheicleide in the 13th Regiment of Light Dragoons, had enjoyed good health till two months before, when he suffered from catarrh and cough following exposure to wet, and was admitted into the Regimental Hospital, where he stayed two weeks. He then performed his duty for nearly a month, and was sent to the Maidstone station on furlough. After three weeks’ residence he was admitted into the Depôt Infirmary, January 12, 1841. He then complained of hard cough, with greenish mucous expectoration, oppression of the chest, dyspnœa, debility, and nocturnal perspirations. The left side of the chest was particularly resonant on percussion, and afforded metallic tinkling over nearly its whole extent; pulse 120, and irregular; heart’s action tumultuous. Ordered a blister and an expectorant mixture, with Tr. Digitalis, &c. &c. His medicines were subsequently varied without any obvious advantage or marked effect, except that of procuring sleep.

On January 25th, about the day on which I saw him, little alteration had taken place, and the symptoms were as follow:—Cough pretty frequent, with greenish expectoration; pulse 112, and small and feeble, but distinct; tongue natural; skin soft. He lay on his back, but could turn to either side, or sit up in bed, without increased distress. The left side of the chest was perceptibly larger than



the right. Impulse of the heart was felt distinctly and solely on the right of the sternum, and indistinctly below the right clavicle. The right side was dull on percussion; pleuritic rubbing was heard pretty generally, but was most distinct inferiorly and posteriorly. Large mucous rattles were heard below the right clavicle, the respiration was bronchial, and bronchophony was distinctly audible in other parts of this lung. The left side was very resonant on percussion; and the respiratory murmur was entirely absent, excepting over a small space on the inner side of the infra-clavicular and mammary regions, where it could be scarcely heard. Amphoric breathing, metallic tinklings, metallic resonance of the voice, and cough, and Hippocratic succussion, were very distinct about the lower edge of the scapula, and were audible, though less obviously, in other parts of this side.

Ordered Decoct. Cinchonæ, &c. during the day, and Morphia at bed-time.

I find no circumstance related particularly worthy of notice till the 29th, when it is stated that he passed the night on the right side, and was then sleeping quietly on the left; that the cough was only occasional, and not distressing; the pulse was 130, and very weak; and that the two sides were becoming equal in volume.

Feb. 21st.—He was able to get out of bed and sit up each day; the dulness of the right side had, in a great measure, disappeared; and the enlargement and rotundity of the left had given place to a more natural configuration, the intercostal spaces being depressed as upon the opposite side. He slept well at night under the influence of morphia, and was but little troubled with cough; appetite good.

March 16th.—Went down stairs for half an hour this day.

20th.—Sent for in haste, and found him with hurried respiration, lying on his back; face purple, and extremities cold; pulse not perceptible; dosing, and speaking with difficulty; in no pain, and perfectly sensible; respiration very short, and hurried. He was temporarily rallied by hot brandy and water, and other stimulants, but soon

relapsed into the same drowsy state, and wished to be allowed to go to sleep, and in this state quietly sank at half-past ten o'clock.

*Inspection, twenty-four hours after death.*

—The *Head* was not opened.—*Thorax*: The left pleura was lined with a firm layer of lymph, one-sixteenth of an inch thick, and contained more than three pints of straw-coloured serum, in which were suspended large flakes of fibrin. The lung was greatly compressed, and lay close to the mediastinum. A small portion of the lower part of the upper lobe was alone crepitant, and corresponded in situation to that part of the chest in which respiratory murmur was sometimes heard during life. The remainder of the lung was occupied either by tubercular deposit or small cavities, some of which contained some soft cheesy matter. One cavity, as large as a small egg, was quite empty, and communicated with the pleura by a circular aperture with rounded edges, half an inch in diameter. It was situated two inches from the summit of the lung, which was firmly adherent to the pleura costalis, as was the base to that covering the diaphragm. The pleura covering the upper and middle lobes of the right lung was adherent by recently effused plastic lymph. About eight ounces of clear serum existed in the lower part of the sac. The upper lobe contained one cavity capable of holding two ounces, and others of smaller size; the remaining portions of the lobe being perfectly airless, from tubercular deposit and grey hepatization. The middle lobe contained a few small cavities; and the lower lobe was crepitant and fairly healthy, independently of cadaveric congestion. The pericardium contained three ounces of serum, and was firmly adherent to the right pleura; it was thus preserved in its situation on the right of the sternum, when all support was removed. The heart was healthy.—*Abdomen*: The peritoneum contained eight or ten ounces of fluid, and, in some parts, bore evidence of recent inflammation. The liver, spleen, pancreas, stomach, and large intestines, presented nothing remarkable. The mucous membrane of the small intestines was much diseased from tubercular deposit



and ulceration, particularly towards the termination of the ilium and the ileo-cæcal valve. The mesenteric glands were also much diseased, enlarged, hardened, and, in some parts, contained cheesy matter.

This case presented, with remarkable distinctness, all the ordinary symptoms and physical signs of pneumo-thorax; yet was the patient able to lie upon either side, or upon his back, to sit up in the ward, and, on one occasion, to go down stairs; and though the side was at first obviously enlarged, it gradually assumed its natural size. It is also to be observed, that the formation of the complaint was marked by none of that urgent distress supposed by Louis to be almost its peculiar characteristic. I made inquiries particularly in reference to this subject, but could obtain no information by which it could be ascertained on what day, or at what time, the gas first escaped into the pleura. The lung was greatly diseased; and the aperture was so large that the air could escape from, as well as enter the pleura with facility. His rather sudden death was most probably connected with a rapid effusion of serum into the cavity.

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CASE VII.—*Pleuritis—Pneumonia—Gangrene of the lung—Pneumo-thorax—Gas in the pericardium.*

J. B., aged 30, an Irish labourer, with dark hair and nearly bald head, looking as old as 45, was admitted into the hospital under my care, August 18th, 1843. He stated that he was quite well a fortnight before, and that he had not been previously troubled with cough, and had never suffered from hæmoptysis; but that twelve days ago, while hard at work, and perspiring freely from his exertion and fatigue, he was suddenly seized with such a severe pain in his left side “that he could not stir;” that he had had no cough, but had suffered only from pain in the side, and that he had neither had, nor sought for any medical advice, till he presented himself among the out-patients at the hospital. He was far too ill to send away, and therefore, though in a wretchedly filthy state, after being well washed with soap and warm water, he was put into a warm and clean bed; and de-

pressed as the poor fellow was, he appeared exceedingly happy and grateful for his accommodation. He was indeed already very low, his face pale, his countenance haggard, and expressive of severe distress; but his skin was hot; his tongue much loaded, brown, and moist; bowels not open for two days; he still said he had no cough, and complained only of pain in the side and difficulty of breathing. His respirations were 40 in the minute; his pulse 120, small, and very feeble; he lay upon his left side, and could lie upon his back, but not upon the right side.

*Physical signs.*—On the left side there was a little increased fulness, but no bulging; the inferior ribs were not elevated on inspiration. Dulness on percussion existed on the left side as high as the spine of the scapula posteriorly, and anteriorly as high as the infra-clavicular region, which alone afforded tolerable resonance. The respiration was inaudible, or distant and tubular, excepting above the line of dulness, and even there was hoarse and imperfect. The voice was on this side less resonant than natural in the parts in which dulness existed, excepting over the mamma, where imperfect pectoriloquism was discovered; while in the infra-clavicular and acromial regions no peculiar modifications of the voice were perceptible. “Tactile vibration” was absent inferiorly. The impulse of the heart could not be distinguished below the left nipple, or on the right of the sternum, but was felt more distinctly and strongly than natural at the epigastrium. The sounds and rhythm were normal. The right side of the chest was resonant on percussion, but the respiratory murmur was obscured by sonorous and mucous rattles. Ordered—

Olei Ricini,  $\zeta$ ss. statim sumend. Appl.  
C. C. parti dolent. ad  $\zeta$ vj. Pil. Antim.  
Opiat. c. Hydr. Chlorid. gr. j. 6tis  
horis e haustu Julep. Ammon. Acetatis.

19th.—He had little sleep in the night; bowels relieved by the oil. He coughed “now and then;” tongue loaded, creamy, and moist; pain of side continued; other symptoms and signs as before.

Appl. Empl. Cantharid. magn. lateri sinistro. Pergat.



21st.—Said he felt better, and had but little cough, and no expectoration; tongue still much loaded, but moist; skin hot, dry, and pungent; pulse 120, small and feeble; bowels not open; respirations 28, easy. The dulness was as before, excepting that anteriorly and inferiorly resonance now existed, arising probably from a distended stomach. The infra-clavicular region was still free from any peculiar morbid sound; but in the left mammary region was now heard distinct amphoric respiration, as from a large tube entering a cavity; and in the same situation was now audible a little resonant mucous rattle, approaching to gurgling, and imperfect pectoriloquism. The impulse of the heart could be felt only at the scrob. cord., where it was still forcible and rather bounding. On this day was for the first time heard a very peculiar sound in the precordial region with each systolic and diastolic movement of the heart, but most distinctly with the former. It was between a rubbing noise and that produced by a solid body striking against a cavity, and causing the agitation of a fluid mixed with gas, or the noise of fluid escaping from a bottle, with intermissions produced by the ingress of air. It might be indifferently represented in letters thus: — Bllop Bllop — Bllop Bllop — Bllop Bllop. It was very loud, most distinct below the left mamma, but audible, but with decreased intensity, as the ear or stethoscope was removed from this part in the course of the aorta, on the right side and the posterior part of the chest, and at the scrob. cordis. It was also distinctly heard when the ear of the observer was removed two feet from the chest of the patient, and imperfectly audible at even three feet. I had never heard anything exactly like it before. It might be supposed to arise from the heart striking against a cavity containing fluid and gas, the parietes of which cavity were covered with soft or plastic lymph. He had either swallowed or not preserved his expectoration, if he had any, but he resolutely maintained that he had none. A porringer was placed by his side, and particular injunctions were given that every thing expectorated might be saved, whatever, or how little soever, it might be.

Capt. Olei Ricini, ʒss. statim. Hydrarg. Chlorid. gr. iss. 6tis horis sumend. e haust. Julep., Ammon. Acetatis, et Vin. Antim., Potassio-tartrat. ℥℥x.

22d.—Said he had nothing the matter with him but weakness; but the skin was intensely and pungently hot, and the tongue loaded. The bowels had been opened by the oil; the blister had healed; the physical signs were unchanged, excepting that some dulness and resonance of the voice existed below the clavicle. It was now ascertained that, so far from having no expectoration, he had brought up about three ounces in the twenty-four hours; that it was of a dirty mucous character, with little froth, resembling bad gruel, and had a very disagreeable, but not decidedly gangrenous odour,

Rep. Empl. Lyttæ magn. lateri sinistro, et pergat.

23d.—Fever intense; physical signs unchanged, but he was far too ill for minute examination.

Rep. pil. et mistura 4tis horis.

24th.—Aspect very much improved; skin much less hot, almost natural in temperature; and tongue much cleaner. The left side was now dull up to the very clavicle, and the voice was very resonant below that bone. The fluid sounds were now not so marked in character, and more resembled the ordinary rubbing or scraping sounds of a roughened pericardium or pleura, but they were still very peculiar, and extensively audible.

Rep. pil. ter die. Contin. mistur. ut antea.

25th.—The cough was neither frequent nor severe, but the expectoration was considerable, dirty, frothless, and foetid. Pulse 120, feeble. Respirations 26, and easy. The heart was now felt at the right of the sternum, as well as at the scrob. cordis, where, as well as over the greater part of the chest, a rough grating sound was heard more or less distinctly, while below the left nipple the curious noise of Bllop Bllop was still audible. He had no heat of skin, and no distress of countenance; the tongue was cleaner, and moist, without any redness, but



indicated the constitutional effects of the mercury. The bowels had been relaxed three or four times.

Hydrarg. c. Cretâ, gr. ij. ; Pulv. Ipecac.  
C. gr. iij. M. ft. pulvis 6tis horis sumend. c. Mist. Mucilaginosâ.

26th.—The bowels were relaxed three or four times in the night, and, to use the nurse's expression, he seemed "very low." Mr. Stocker, the apothecary, was sent for, and ordered an opiate enema. He had no evacuation subsequently, but he rather unexpectedly expired at a quarter to 12 A.M.

*Inspection, 49 hours after death.*—The head was not opened. Thorax: on removing the sternum, the anterior edge of the left lung was found to extend to the right side of that bone, so as almost to conceal the heart, which was itself pushed much to the right side, the apex being opposite to the middle of the sternum. The pericardium, wherever in contact with, was adherent to, the left pleura pulmonalis by pretty firm and œdematous lymph. Before it was opened it appeared distended; but on a section being made of the membrane, it seemed not to be more than two-thirds filled by the four ounces of clear yellow serum which it contained. At the bottom of this fluid was one loose mass of flocculent lymph, and upon its surface were several bubbles of gas, varying in size from a pea to a small marble. At one spot, which was adherent to the pleura, and opposite to a cavity to be afterwards mentioned, it was very red, and appeared almost on the point of giving way. The heart itself was soft and flaccid, but in other respects, together with its valves, was perfectly healthy. The greater portion of the upper lobe of the left lung was adherent to the costal pleura by firm lymph, and, with the exception of the thin internal edge, which was white and transparent from œdema, was of a dirty greenish colour, perfectly airless, sank in water, and contained several depôts of matter of the size of peas, but no trace of tubercles. The lower lobe was anteriorly adherent to the costal pleura, to the pericardium, and to the diaphragm. On separating the adhesions to the costal pleura, the finger passed into a large cavity in the serous

membrane, from which burst a large quantity of foetid gas, and dirty gruel-like serum, the amount of which had caused a considerable descent of the diaphragm on that side. The quantity of the fluid was about five pints. The surrounding membrane was covered with a thick layer of yellowish opaque-fibrinous exudation. The lower lobe of the lung contained several cavities, which were generally of the size of a bean, but two of which were as large as a pullet's egg, though irregular in form. One of these was close to the diaphragm; the edges of the other were firmly adherent to the pericardium, opposite to the apex of the heart, and to that portion of the serous covering of the organ which has been previously mentioned as being of a deep red colour. These several cavities were almost empty, and had a soft, flocculent, dirty, brownish-green lining. Their external parietes were well defined, and surrounded by pulmonary tissue, which was dark, but still crepitant. The odour was foetid, and the loose shaggy membrane of some of them floated in the pleuritic fluid, into which air blown into the left bronchus freely escaped, through the large irregular apertures thus formed. It was attempted to be ascertained if air passed from any cavity into the pericardium, by inflation of the lung. The attempt was not successful; but as it was made previously to the lung being disturbed, it is pretty certain that a great portion of the air contained in the left pleura was introduced thereto by these means. The right lung was healthy. Abdomen: The liver was large and myristicate. The kidneys large, congested, and coarse. The stomach and intestines, spleen, and pancreas, appeared healthy.

The preceding case presented many very remarkable features. Among the principal are the strange noise caused by the motion of the heart, and the presence of air in the pericardium. My colleague, Dr. Addison, and several, but too few, of the pupils heard this noise, and agreed that they had never heard anything exactly like it before. Dr. Addison rather curiously compared it, without any communication with me, to what I had in my note-book previously represented it to be like, viz. the heart beating against a



cavity containing both air and fluid. It is somewhat remarkable, that of this noise three *possible* sources were discovered after death, viz. air mixed with serum in the pericardium, gas mixed with fluid in the pleura, and a gangrenous cavity in the lung close to apex of the heart. Of these, I believe the last to have been the most probable, or the almost certain origin of the noise; and for the following reasons:—Though no obvious source of the air in the pericardium was discovered, it may be a question for very reasonable doubt if it existed therein long before death, and if it did not escape by minute apertures from the gangrenous cavity connected with it through the spot of highly inflamed membrane. The rhythm of the heart was perfect when the noise was the loudest and most peculiar, and indeed whenever I examined it. There was none of that tumultuous action, or inequality, which would almost certainly have existed, if air together with fluid had been present in the pericardium. That the noise arose, not from the agitation of the gas and serum in the pleura, communicated by the heart through the partially consolidated lung, is rendered probable by what I have previously stated, viz. that a great portion of this air was almost certainly introduced into the pleura by the inflation of the lung after death, by the reflection that no positive indication of the existence of pneumo-thorax was discovered during life, and that, though the noise was heard in most parts of the chest, it was most loud over the apex of the heart. That it did arise from the beating of the apex against the gangrenous cavity containing air and fluid appears probable from the circumstance last mentioned, from the exact resemblance it had to a noise arising from such a cause, and from this supposition being consistent with all the other signs and symptoms presented by the disease.

It may also be worthy of notice, that the gangrene did not affect that portion of the lung which was most inflamed, but that which was most compressed by the fluid. I mention this, not because I believe that pneumonia never gives rise to gangrene in persons who are low and wretched, and nearly starved by cold and abstinence, but because I think that,

in this case at least, it probably arose from the supply of blood being partially cut off from the lung of a person already much reduced by his disease, that lung being prevented from collapsing by old and firm adhesions to the costal and phrenic pleura. If this view of the cause of the gangrenous cavities is correct, it may be questioned if it would not have been advisable to have tapped the chest. I think it would certainly have been a proper plan of treatment to have been adopted; and I was constantly upon the watch for a favourable opportunity, as regarded the condition of the patient, of having the operation performed. Unfortunately no such opportunity appeared to me to present itself. The man probably ultimately died from the escape of air into the pericardium.

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#### CASE VIII.—*Phthisis—Pneumonia—Empyema—Pneumo-thorax?*

(I lament that this case is in every respect defective. I took no notes of it myself, and am indebted to the public records of the hospital and my own memory for the few particulars detailed.)

W. L., aged 25, a shoemaker, residing in Bermondsey, of small and delicate frame and sickly aspect, presented himself to me among the out-patients of the hospital, Nov. 23d, 1842, but being exceedingly ill, was taken in and placed under other care. He stated that he had been in the habit of working in a damp room, and that he was first attacked with pains in the limbs, followed, in about nine days, with hoarseness and cough. In one of his attacks of coughing he expectorated a tea-cupful of bright frothy blood. His mother died of an affection of the chest, accompanied with cough. A fortnight previously to his application he had been seized with pain of the chest. He had lost flesh, and perspired at night. On admission he was affected with pain of the back and left side; frequent cough, with expectoration of muco-purulent matter mixed with blood, and considerable dyspnoea. The whole of the chest was rather dull on percussion, but this dulness was particularly remarkable in the lower part of the left side, anteriorly and posteriorly. Cavernous respiration and



gurgling were audible over the left mammary region, and muco-crepitating rattle throughout the greater part of this side posteriorly; but both at his admission and during the few days he afterwards lived, he was in too feeble a state for minute physical examination. He constantly lay upon the left side. In the notes of his case I perceive nothing particularly worthy of notice till his death, Dec. 6th, except that he continued to complain of pain in the left side, that he perspired profusely, and that the expectoration became purulent, and "left the side of the vessel in a mass."

*Inspectio cadaveris, 32 hours after death.*

—On removing the sternum a cavity was laid open in the mammary region as large as half a foetal head: it appeared perfectly circumscribed by the surrounding adherent pleura, was crossed by bands, and lined with loose opaque fibrin, but its connexion with the bronchial tubes was unfortunately not examined. The pleura, in a sac entirely unconnected with the cavity just noticed, contained a pint and a half of puriform fluid, and was at other parts covered with a pale dense and thick new membrane. The lung itself was sprinkled with large opaque white tubercles, and was in different parts firm, watery, or purulent, from a low form of pneumonia. The right lung was firm and oedematous. The heart was natural, and nothing remarkable was discovered in the abdominal viscera.

I have introduced this very imperfect case solely on account of the cavity in the mammary region, which I believe to have been a defined pneumo-thorax, accompanied during life with all the signs of a phthisical cavity. Its especial relations with the pleura and with the bronchial tubes were unfortunately not minutely investigated, and I am therefore unable to pronounce, with absolute certainty, that my belief was founded on fact.

CASE IX.—*Phthisis—Pneumo-thorax?—Empyema?*

J. D., aged 28, admitted into Guy's Hospital, August 2d, 1843, under the care of Dr. Babington. He formerly carried on the business of a sail-cloth maker in the country, and was at that time in the practice of drinking pretty freely of gin and water. His

subsequent occupation as an inn-keeper at Islington, probably tended but little to the diminution of this habit. To the cold and damp cellars of his establishment he attributed the origin of his present illness, during great part of which he had been confined in the Queen's Bench Prison: he was thence removed to the hospital. He had lost one brother at the age of 50, but he had a father, mother, two brothers, and one sister, still alive, and in good health. For the last two winters he had been troubled with cough for six or eight weeks, but he had hitherto always lost it during the summer. On admission he was pale, thin, and freckled; of light complexion, and about 5 feet 10 inches high. For the last three months he had been more or less troubled with rheumatism, and four weeks since he had a severe pain of the left side, since which his cough had been less frequent and troublesome. He had at no time any large amount of expectoration, nor did he remember ever having been attacked with sudden and violent dyspnoea. He lay on his back, with his shoulders slightly elevated, and the body rather turned to the left side, but he could lie without inconvenience upon either side, or perfectly supinely. He had but little cough, and his expectoration was scanty, thick, muco-purulent, and destitute of air-bubbles. He talked freely, and sat up in bed without distress. The skin was natural, and he said he did not perspire except in very hot weather; the pulse 120, very small and feeble; the respirations 26, and perfectly easy; the face and body were emaciated, the countenance expressive of care, the tongue clean and moist, and rather pale. *Physical signs.*—Some flattening existed below both clavicles, but the form of the chest was not otherwise abnormal; no enlargement or bulging was perceptible. The right side sounded generally pretty well upon percussion, and the respiratory murmur was no where deficient, though at some parts it was puerile, and in others hoarse and rough. The infra-clavicular, and upper part of the mammary regions of the left side were more resonant than natural, but not tympanitic upon percussion; and in the recumbent position there appeared little or no dulness anteriorly, even at the



lowest part of this side of the chest. Posteriorly dulness existed as high as, or above, the inferior angle of the scapula. The respiratory murmur was imperfectly audible both before and behind at the upper part of the left side, but near the nipple the breathing was occasionally fistulous, with a metallic ringing. This was not observed to accompany the voice or cough. Posteriorly and inferiorly the respiration was either entirely absent, or distant and indistinct. There was not at this part resonance of the voice or tactile vibration. About the lower angle of the scapula, Hippocratic succussion was easily and constantly produced by shaking the body. I had many opportunities, by repeated experiments, of verifying these signs, which never materially varied. He died, rather unexpectedly, August 14th. The inspection of the body was not permitted.

As the body in this case was not examined after death, it cannot be asserted, positively, that it was one of pneumo-thorax and empyema. I have, therefore, inserted a note of interrogation after these terms at its heading. I believe, however, there was at the time but little if any doubt upon the subject. If the presence of this affection is assumed, the case presents a striking instance of the absence of the marked symptoms which often accompany the first formation of the complaint; as the patient stated, after repeated examinations, that he had never been suddenly seized with dyspnoea or collapse, and it was almost accidentally that some of the most marked signs enumerated were discovered at the first visit. The side was not enlarged, there existed no tympanitic resonance on percussion, and, except where the presence of fluids was clearly indicated, the respiratory murmur was not altogether absent. If the case, on the contrary, be regarded as one of simple phthisis, then it presented the still more rare phenomenon of Hippocratic succussion in a phthisical cavity.

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CASE X. — *Phthisis — Pneumo-thorax — Empyema. — Death after about two months.*

(For the previous history of this case I am

indebted to Mr. Arnold, the industrious clerk of the ward.)

H. S., aged 26, stated to be a widow without children, admitted into Guy's Hospital, Sept. 13, 1843, under Dr. Babington, but during his absence from illness placed under my care. She was of fair complexion, with light hair, and had always been "delicate." She had lived loosely and intemperately, had ulcers on the legs for the last two years, and for the last six months had been greatly dejected in spirits, from having been deserted by a person with whom she had previously cohabited. She had been treated for hysteria. About six weeks before her admission she had severe shiverings, followed by heat of skin, thirst, sore throat, cough, difficulty of breathing, and pain of the chest, many of which symptoms had continued with greater or less severity up to that time. She came to the hospital for advice till five days before, when she was *suddenly seized with violent dyspnoea without pain*, and had since been confined to bed without medical assistance. When first brought to the admission-room she was pale and faint, and breathed with such evident distress as to lead me to say, "that person breathes like one suffering from pneumo-thorax." I ordered her to be put to bed immediately, but had little thought that the supposed resemblance would prove to be a reality. When first visited her face was bedewed with perspiration, her extremities clammy, and her dyspnoea was extreme. She was exceedingly faint; the pulse was so feeble and frequent as not to be counted, and the distress so great as utterly to preclude any examination: she was therefore ordered some wine, and to be kept perfectly quiet. When seen two hours after, she had rallied a little, and was lying on her right side. Her respirations 40 and anxious, her pulse 120, and very small and feeble. The extreme distress previously exhibited by her countenance had in a great measure disappeared, but she could, even then, not speak above a whisper. She had no pain, very little cough, and scarcely any expectoration; the very trifling quantity seen was muco-purulent; the tongue was rather dry, and brown; she complained of thirst, but



had no vomiting or flatulence; the bowels were rather relaxed; the catamenia, previously profuse, had been altogether absent for the last two months. *Physical signs.*—Huge pendulous mammæ, reaching nearly the umbilicus, and still urgent distress, prevented any minute examination. The ribs on the left side were alone elevated upon inspiration. Percussion elicited a dull sound over the whole of the left side anteriorly, and over the infra-clavicular region of the right side. The latter was preternaturally resonant under the mammæ and in the axillary and lateral regions. Both sides were moderately and nearly equally resonant posteriorly, conceding on the right some dulness, on account of the liver. Throughout the whole of the left side, anteriorly, were heard mucous rattles, which below the clavicle approached the character of gurgling. Posteriorly, on this side, sonorous and sibilant rattles were chiefly audible, mixed at some parts with pure bronchial respiration. The respiratory murmur was absent over the whole of the right side. Some bronchial breathing was alone audible in the acromial-scapular and infra-clavicular regions, and close to the dorsal spine. At other parts, and particularly posteriorly, was heard shrill metallic respiration, but no distinct tinkling. The cough and voice, as far as she was capable of exciting the one or of employing the other, were purely metallic. Hippocratic succussion was very evident. These signs were gradually and slowly elicited, as her strength would permit. Ordered—

Julep Ammoniz, 4tis horis; Ext. Hyoscyami, gr. v. hora somni; Wine, ʒiv. or vj., as required, Good beef-tea and arrow-root. Perfect rest.

By the employment of these means she rallied surprisingly, and though, when recumbent, she constantly lay upon the right side, she was able to sit up in bed without distress; colour returned to her cheeks; her countenance lost much of its anxious expression; the cough was far from severe, the expectoration trifling, and the respiration no longer laborious. Physical signs unchanged. By the aid of a pill containing a quarter of a

grain of muriate of morphia, she slept well at night.

Sept. 28th.—She lay the whole of last night upon her left side, and at the visit was sitting up in bed and looking cheerfully. The breathing was not now amphoric, but the voice and the cough still had a metallic resonance, and the splashing on succussion was still distinctly audible. Harsh respiratory murmur, with bronchial respiration, was now heard in infra-clavicular, acromial, scapular, and interscapular regions. The dulness and mucous gurgling of the left side had much decreased. She slept well, and had some appetite. Ordered—

Decoct. Cinchon. Julep. Ammoniz, aa ʒvi. ter die. Rep. Pil. Wine as before, and a mutton chop.

Oct. 10th. — She had been going on quietly, was cheerful, sat up in bed, and for a part of several days past had been dressed and sitting by the fire, though her breathing was rendered difficult by motion. She had scarcely any cough, and lay occasionally for the entire night, without distress, upon the left side. An attempt was made to measure the chest. This I have always found to be difficult to effect with exactness, but the immense mammary appendages to the chest in this instance caused much additional obstruction. The right side, upon inspection, seemed to be certainly not larger than the left, and was supposed to be found by admeasurement  $1\frac{1}{4}$  inch less. This, however, I believe, could not be trusted, and it was proposed to be attempted at a future time, but as the patient objected, and desired “not to be pulled about,” the intention was never fulfilled. She continued for many weeks much in the same state. I saw less of her, in consequence of her physician, Dr. Babington, having resumed his duty, but I ascertained that the symptoms and local signs continued, without much alteration, till about two weeks before her death, when she became more distressed in mind and body, and complained of pain in her left temple. For this a few leeches were ordered, without benefit, and her wine, which had been previously discontinued, was afterwards restored without advantage. She



now began gradually and slowly to sink, and her dyspnœa increased very considerably. She complained of pain in the left side, but said it was not severe. On the morning of Nov. 18th, nine weeks after her admission, after taking her breakfast as usual, she was found dead in her bed. She was at first supposed to be asleep, so quietly had she expired.

*Inspection, 53 hours after death.*—I was not present before the body was opened, and the sides were unfortunately not measured. The head was not opened.—*Thorax*: On the scalpel entering the right pleural cavity, fluid and a little air escaped with great force and noise. Two quarts, at least, of thin cream-coloured fluid were found in the right pleura, and the lung was thereby much compressed towards the spine, and the mediastinum pushed to the left side. The serous membrane, excepting at the apex, where it was adherent, was every where covered with a thick layer of yellowish-white fibrin, which was soft and flocculent externally, but firmer and smooth near the pleura. No aperture was visible in the pleura, nor could any be discovered till the lung was removed entire and inflated under water, when a small pin-hole opening was found, which communicated by a tube of fibrin about a quarter of an inch long, with an irregular cavity as large as a nutmeg close to the surface of the serous membrane. The cavity, situated quite at the lower part of the upper lobe, had a soft, loose, yellow lining, and was entered by a bronchial tube as large as a crow-quill. The surrounding lung, to the size of a pullet's egg, was firm from old pneumonia and tubercles. No other cavity was discovered. The other parts of the lung were scantily sprinkled with opaque tubercles. Most parts were pretty crepitant and distensible by air, and no part was absolutely solid except that around the cavity. Many of the bronchial tubes were largely dilated. The apex of the left lung was adherent and consolidated, from old pneumonia, all activity in which had ceased. As the probable results of inflammation, however, had been left several portions of opaque, white, firm, and even hard, scrofulous matter, as large as peas, in separate and agglomerated masses. The remainder of the

lung was affected with slight recent pneumonia. The pericardium was healthy. The heart was rather pale, loose, and flabby; its valves were not diseased, nor were its cavities dilated. In the apex of the right ventricle was a firm mass of leathery fibrin, which appeared to have been formerly hollow, and to have contained fluid which had escaped, and thus allowed of the collapse of the cyst. Other small detached masses were confined by the bands of the muscoli pectinati.—*Abdomen*: The stomach was red, tumid, and ulcerated. The liver was large, partly coloured, soft, and fatty. The kidneys were firm and coarse, and their tunics adherent.

The history of this case is somewhat doubtful and obscure, as the patient had been supposed to be suffering from hysteria alone before her admission. By whom she had been prescribed for, I could not ascertain, but I distinctly found out that she had not been seen by any of the professional officers of the hospital. What had really been the train of previous symptoms could not be accurately determined, and the period of the escape of air into the pleura could not be defined with any thing approaching to certainty. It might have been five days before her admission, when she was stated to have been seized with sudden and violent dyspnœa; but even upon this point the patient and a constant female attendant varied considerably in their representations. It might have been on the very day of her admission, when the distress was extreme. If the latter supposition was correct, then it is almost certain that pleuritic effusion had previously existed, though not in sufficient quantity seriously to embarrass the respiration, or compress the lung; as, on the day she entered the hospital, she was affected with all the symptoms, excepting pain of the side, which Louis has supposed (but as I conceive incorrectly) always to accompany the escape of air into the pleura. The aperture in the pleura was very small; the cavity in the lung with which it communicated was small also; the lung was comparatively slightly diseased; few or not extensive adhesions existed; the distress and dyspnœa, on admission, were excessive. The aperture, indeed, was so small that it required all the



delicacy and perseverance of my friend, Mr. Hilton, even with the aid of the blow-pipe, to detect it. Had not the blow-pipe been employed—still more had not the untiring energy of such an individual as Mr. Hilton been exercised—would not this case have been put down as “a remarkable instance of the secretion of gas by the pleura?” I believe that it most certainly would have been so recorded. The patient probably ultimately died from the serous effusion into the pleura, and possibly might have been temporarily relieved by paracentesis thoracis, had she been considered in a fit condition to undergo the operation.

CASE XI. — *Pneumonia — Empyema — Pneumo-thorax — Pericarditis — Adhesion of the diaphragm.*

J. B., a tall, thin, but strong man, with light hair and eyes, by trade a baker, was admitted into the hospital December 8th, 1836. Four years before he had suffered from cholera, and a year after had an attack of inflammation of the chest, for which he was bled, and from which he speedily recovered. From that time he had enjoyed good health till about ten days previously to his admission, when, after exposure to wet and cold, he was attacked with cough, pain of the chest, rigors, and an inflamed and swollen state of the feet; for which he had been under medical treatment, but had not been bled. On admission his countenance was flushed and anxious, and the pupils dilated; his tongue was moist and white, and the skin cool. He complained of pain of the right side and shoulder, which was not increased on pressure. He had a distressing cough, accompanied with some expectoration of thick and very tenacious mucus; the pulse was 78, labouring, but not hard. In the lower posterior and lateral portions of the left side mucous and crepitating rattles were audible. They were also present, but less distinctly, over the inferior and middle portions of the right side posteriorly. The respiration was free on both sides anteriorly.

Ordered—V.S. ad 3xiv.; Pil. Antim. Opiat. fort. c. Hydrarg. Chlorid. gr. ij. statim post venæsection et vespere repetend: si opus. fuerit.

9th.—He was much relieved by the bleeding, and had passed a comfortable night; countenance greatly improved; complained of pain above the left clavicle; pulse 86, more free; expectoration small in quantity, pneumonic, mixed with bronchial mucus. Bronchophony and crepitation heard over the lower part of the left lung posteriorly. The blood was cupped and buffy.

Ordered Pil. Antim. Opiat. c. Hydrarg. Chlorid. gr. ij. 6ta quâque horâ c. Haustu. Jalep. Ammon. Acetat. et Vin. Antimon.

The next day he was so much better that the pills were ordered to be taken at bed-time only, and the draught to be taken as before. He continued to improve, so that on the 14th the pills were altogether omitted; but on the 21st, having complained of pain of the left side, he was ordered to be cupped, and was quite relieved by the operation.

On the 24th he had a troublesome cough, with watery mucous expectoration, and muco-crepitation was audible in both lungs posteriorly; pulse 110, rather sharp; bowels confined; skin perspiring; tongue clean and moist.

Ordered—Pil. Hydrarg. gr. j.; Ext. Hyoscyam. gr. j.; Pulv. Digitalis, gr. j. M. ft. Pil. ter die sumend. Rep. Haust.

His cough was relieved the next day, and the pills were omitted the day after. He continued to be occasionally troubled with a return of the cough, being alternately better and worse, till January 10, 1837, when in consequence of pain, and the sudden supervention of tubular breathing in the right side, he was ordered again to be bled, and to resume the medicines prescribed the day after his admission. He was again relieved; but on the 14th the operation was thought to be again necessary; the pills were changed for Hydrarg. Chlorid. gr. j.; Ext. Hyosciam. gr. vj. 4ta quâque horâ, and a mixture prescribed containing Tr. Digitalis mviij., for which was substituted, on the 19th, Mist. Cretæ, in consequence of relaxation of the bowels, together with a pill composed of Ext. Conii and Ipecacuanha for his cough.

The daily reports of the case are long, and



would perhaps appear tediously prolix ; I therefore pass to that of January 31st, when it was stated that he had passed a very restless night from great dyspnœa and difficulty of expectorating sputa, which had increased in quantity. He perspired profusely ; was much emaciated, and had flushing of the cheeks ; the pulse was 140, and small. The right side was exceedingly dull on percussion ; and upon admeasurement was found to be an inch larger than the left. The ribs passed more horizontally outwards than natural, and were scarcely moved upon inspiration ; the intercostal spaces were manifestly widened, but not bulging. Respiration was scarcely audible, and very distant, in the part affected.

February 3d.—Countenance much shrunk ; breathing greatly oppressed ; pulse very feeble and small ; tongue clean ; he had been delirious, and got out of bed during the night. A splashing noise was now for the first time heard on shaking the body ; but no part of the side was discovered to be abnormally resonant on percussion. Dr. Davies' grooved needle (it having been previously introduced between the 6th and 7th ribs anteriorly without effect), was now passed into the chest between the 9th and 10th ribs posteriorly. A little serous fluid alone escaped. A small hydrocele trochar was afterwards used. Several ounces of sero-sanguineous fluid, coagulable by heat, slowly flowed through the canula, till it was introduced to its full extent, when there escaped in jets corresponding with the respiration, and much more freely than before, a large quantity of sero-purulent fluid, in which floated albuminous flakes. Six pints and a quarter were thus withdrawn, and the patient expressed himself as being much relieved. He then became faint, and the canula was withdrawn. The edges of the wound were drawn together by plaster, and a bandage applied around the chest.

Beef-tea and brandy were now taken ; and subsequently a sedative draught was administered.

In two hours and a half after the operation, the expression of countenance had improved ; the pulse was less contracted, and he felt better. He had a little sleep at short

intervals, several times in the recumbent position, but in the evening the respiration was more hurried, and he was very restless ; pulse 120, small, and feeble ; skin cool. He was supported with beef-tea, isinglass, and wine ; and was ordered to take a narcotic draught at night, and some ammonia if required. The next morning he still appeared relieved, having slept three quarters of an hour on two occasions during the night. The cough was less troublesome, and the expectoration scanty ; pulse 120, very small ; respirations 46 ; amphoric breathing was now distinctly audible on the right side, and puerile respiration on the left side of the chest, and the sounds of the heart were heard on the right of the sternum. The bowels had not been moved for three days ; the urine was scanty, with a copious deposit of the lithates. During the afternoon he became very restless, and awoke, after ten minutes' sleep, with spasmodic dyspnœa and "risus sardonicus," which recurred three or four times before eight o'clock in the evening, when he expired. It was remarked that notwithstanding the large amount of fluid in the right pleura, the liver could on no occasion be felt below the ribs.

#### *Inspection, 30 hours after death.*

*Chest.*—The right pleura pulmonalis was very firmly adherent anteriorly to the parietes of the chest, inferiorly to the diaphragm, and posteriorly to spine and adjoining ribs, so that on removing the sternum it was necessary to detach the lung from the ribs anteriorly before the cavity of the empyema could be reached. On separating the adhesions which connected the lung to the fourth or fifth rib, a quantity of gas escaped. The cavity thereby opened into the sac of the pleura contained besides air about two pints of thick purulent fluid. The pleura was lined with a thick firm layer of fibrin, which was curiously arranged in parallel ridges opposite to the intercostal spaces, like sand left by a retiring tide. The lung contained no tubercles. Though much compressed, it contained in some parts a little air, and was in other parts fleshy and œdematous. No opening was discovered in the pleura, but the investigation was not made



with the blow-pipe under water. The aperture was not improbably concealed by the dense albuminous coating which encased that portion of the membrane which was in contact with the effused fluid. A separate and defined collection of sero-purulent fluid existed in the fissure separating the upper from the middle lobe of the lung, but in every other part the fissures were obliterated by old and firm adhesions. The diaphragm was greatly deformed, the pleura covering that portion of it which adjoins the inferior false ribs having contracted firm adhesions to the costal pleura, and thereby formed a boundary to the empyema. Below this it was not adherent; it thus preserved a small separate serous cavity made up of phrenic and costal pleura alone, which was free from purulent effusion. Towards the median line, being also firmly adherent to the base of the lung, it was put upon the stretch by the pressure of the fluid above, and consequently deflected downwards. It thus formed a double layer of muscle and serous membrane, so that several square inches were removed from contact with the liver on its abdominal surface. The phrenic peritoneum was in apposition with itself, or was merely covered with a little plastic effusion, over the extent of surface thus curiously doubled up and projecting into the cavity of the chest; but beyond this it became re-adjusted to the convex surface of the liver. The left lung was glued to the thoracic parietes by some old pleuritic adhesions, the two lobes being partially joined together by well-organized false membrane. The costal pleura, with this exception, was healthy. The anterior edge of the upper lobe of the lung was somewhat rounded by emphysema, and near the apex anteriorly was a circumscribed indurated portion of lung, the size of a crown piece, extending about an inch into its substance. It was of a pale greyish colour, airless, unyielding, and apparently recently hepatized. The posterior portion of this lobe was tough, and upon being divided a quantity of frothy serum exuded from it. The bronchial tubes were not dilated. The lower lobe was scarcely so permeable by air as the upper, with the exception of the superior and posterior

edge, which was tolerably healthy. The thick posterior portion upon section allowed of the escape of a large quantity of serous fluid mixed with some which was more viscid and puriform, but was notwithstanding generally crepitant. The pericardium contained about two ounces of yellowish slightly turbid fluid, and near the apex of the heart were seen a few delicate bands of imperfectly organized lymph. The serous membrane itself was injected in some parts, and was universally rather opaque. The heart was rather large.

*Abdomen.*—The liver was large and myristicate, and its acute margin was of a very dark colour. No other morbid appearances were observed.

This protracted, severe, and perplexing case, for the recorded facts of which I am principally indebted to the notes of Messrs. Oldham and Cooke, who were successively clinical clerks at the period, has many remarkable peculiarities. Among the most striking, are the strange adhesions and duplicature of the diaphragm, which were probably the products of the most distant disease, and may possibly be ascribed to the inflammatory affection occurring some years before. These adhesions of the diaphragm to the ribs and to the whole of the base of the lung effectually prevented the descent of that muscle, and the consequent protrusion of the liver downwards and forwards by the fluid accumulated in the pleura, and consequently deprived the observers of one of the most common characteristic signs of empyema of the right side, according to the representations of Dr. Stokes. My own observation in other cases has not, however, induced me to place so high a value upon this sign as it has been supposed to possess by that gentleman.

Another remarkable peculiarity was the firm adhesion of the lung to the anterior parietes of the chest, which, together with those connecting it with the diaphragm, and the ribs adjoining the spine, prevented the total collapse of the organ; so that, notwithstanding the large amount of fluid and gas, the lung in some parts remained pervious to air and crepitant even to the last. Herein the case forcibly illustrated the statements made in a



former part of this paper in reference to the preservative influence of adhesions in cases of pneumo-thorax, and resembles a case related by Laennec, in which the chest was similarly punctured, but no fluid evacuated, in consequence of similar adhesions of the lung to the costal pleura. At what time air escaped into the pleura could not be correctly determined, as no decided symptoms characterized the occurrence. But as the expectoration is said to have increased on January 31st, and Hippocratic succussion was first noticed on February 3d, it is probable that it took place a few days only before the patient's death. As no aperture was found in the pleura, this case may be supposed to favour the notion of the formation of gas by the decomposition of the effused fluids: but to this opinion are opposed the facts of the fluid withdrawn by the trochar being destitute of disagreeable odour, and the occurrence of amphoric breathing after the operation. I have not myself the slightest doubt that with the expenditure of a necessary amount of care and trouble in the investigation of this case, the examination of which, as it was actually conducted, occupied a very long time, the opening would have been discovered.

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CASE XII.—*Phthisis*—*Pneumo-thorax*—*Empyema*—*Death after nine weeks.*

(Very beautifully drawn up by my young friend Mr. Weston, now in India, and reported almost entirely in his own words.)

J. S., aged 32, a rather emaciated man, of sallow complexion, with dark hair and eyes, by occupation a labourer, was admitted into the hospital, April 3d, 1839. He had been accustomed to work hard and drink freely, sometimes as much as two gallons of beer a day. His mother had died of phthisis, but the rest of his family had enjoyed good health. Sixteen years ago he suffered from ague, and he had since had three attacks of rheumatism. For the last nine or ten years (the first two-thirds of which period he spent near Chichester, and during the last third had been working in the Dock-yard at Woolwich) he had been subject to cough, which for the last twelve months had

been much more frequent, and accompanied with increased expectoration, dyspnoea, gradually progressive emaciation, and perspiration upon waking in the morning. While in nearly the same condition as in months passed, he was, during a violent fit of coughing three weeks ago, suddenly seized with severe pain in the lower part of the right side of the chest, accompanied with great dyspnoea, which lasted for three or four hours. At the expiration of this period he felt a little easier, though not free from pain and shortness of breath. Thus he continued till the next morning, when he awoke with pain as severe as before. Some internal medicines were administered, and a blister applied, which produced a mitigation, but not a cessation, of his suffering, which had continued more or less ever since. The expectoration, which before was copious and muco-puriform, had since been trifling, but it had been, once or twice, streaked with blood. On these occasions only had he ever noticed any blood in the sputa. Before his present attack he never tried to lie upon the right side, as he was accustomed always to lie upon the left; "but during the whole of his present illness he has found it impossible so to lie." For the last five weeks he had been unable to lie even upon the left side, and had consequently kept upon his back. The breathing, except at the onset of the malady, had not been shorter than it was before. During the last week or ten days he had perspired at night more profusely than usual, but it did not appear that he had had any distinct hectic paroxysms.

Upon admission, he complained chiefly of pain in the lower part of the right side of the chest, increased upon pressure. His cough was only occasional, and his expectoration rare and scanty. The breathing did not appear much oppressed—respirations twenty-six in the minute; the pulse was regular, small, easily compressed, 120 in the minute; the skin was cool and rather harsh; the tongue moist, but slightly furred; the bowels open.

*Physical signs.*—In the recumbent position, the lower two-thirds of the right side of the chest were much too resonant on percussion. The upper third of the right



side, and the whole of the left side, yielded a natural resonance. On applying the ear or stethoscope over the lower two-thirds of the right side, no respiratory murmur was heard; but amphoric respiration and metallic tinkling were audible, with occasional metallic resonance of the voice, and cough. At the upper part of the right side, at a spot just below the clavicle, there was cavernous respiration and very marked resonance of the voice; and around this spot there was muco-crepitation. On the left side of the chest, anteriorly, the respiration was puerile, especially over the upper half of the lung; below it was accompanied with a little cooing murmur. When the patient sat up in bed, the lower two-thirds of the right side, anteriorly, still sounded too resonantly on percussion; and in the middle third amphoric respiration and metallic tinkling were still heard. The upper third of the lung afforded the same signs as when he was lying down. Posteriorly, the entire chest sounded naturally resonant on percussion, except at the lower part of the right side, which was rather more dull than natural. At the lower third of the right side there was absence of respiration; in the middle third amphoric respiration, metallic tinkling, and metallic resonance of the cough; and above the spine of the scapula increased resonance of the voice, cavernous respiration, and muco-crepitation. On the left side the respiration was puerile, and at the upper part accompanied with muco-crepitation. Succussion caused a decided fluctuation of fluid within the right pleural cavity. The fluid was not only heard distinctly to splash against the parietes of the chest, and a metallic tinkling to follow the splash, but the agitation of the wave, caused by the succussion of the contained fluid, was distinctly felt by the hand, and by the patient himself. Upon admeasurement there was no appreciable difference found between the two sides of the chest. The heart was heard to beat in its natural position, and nothing morbid was observed respecting it, with the exception of its action being too rapid. The liver was not felt below the ribs, nor was the spleen perceptibly enlarged. Ordered—

C. C. lateri dextro ad  $\text{ʒx}$ . Julep Ammon.  
Acetatis c. Vin. Antim. Potassio Tart.  
 $\text{ʒss}$ . 4tâ. quâque hora.

The pain of the side was removed by the cupping; but I find no other circumstance worthy of record in the progress of the case till his death on the 5th of May, six weeks after his admission to the hospital, and nine weeks after the supposed occurrence of pneumo-thorax.

*Inspection, 24 hours after death.*

The body was considerably emaciated. The head was not opened. *Chest*: The right pleura pulmonalis was superiorly connected with the parietes by a few old adhesions. The pleura was in other parts covered with a thick, soft, and whitish albuminous layer, and contained about 24 oz. of sero-purulent fluid. The remaining space not occupied by the greatly contracted lung was filled with gas. The lung was reduced to the size of a very large orange, and had in several parts small vomical cavities and tubercles in various stages. On its anterior surface were three small rounded openings connecting as many small vomicæ and bronchial tubes with the cavity of the pleura. On the left side old adhesions almost entirely obliterated the pleural cavity. The lung was, in most parts, sprinkled with tubercles, and contained in the upper part a few small cavities filled with dirty purulent fluid. The larger bronchial tubes were greatly obstructed by purulent mucus, and the smaller tubes were much dilated. The pericardium contained about one ounce of serum, but, together with the heart, was otherwise healthy. *Abdomen*: The liver was large, congested, and granular; the spleen was also large and firm. The kidneys were simply congested, but their tunics were unnaturally firmly adherent. The stomach, and the small and large intestines, were healthy.

In the preceding case is presented a fair example of pneumo-thorax in its more common form, the accession of which was well marked; and the general symptoms and physical signs accompanying the progress of which were exceedingly characteristic, and correctly reported by Mr. Weston. The lung, though containing several small cavi-



ties, was adherent to the parietes only to a small extent, and, as was indicated by the small size to which it was reduced, was not much consolidated. Hence the space admitting the collection of air in the pleura was comparatively large, and hence the symptoms occurring when the accident took place were comparatively severe. But as the apertures, though small, were three in number, and were also round and free from obstruction, and therefore admitted of the free egress from, as well as the ingress of the air to the pleura, the distressing symptoms were not of long continuance. Caused by the sudden change of the circulation, and accumulation of blood on the right side of the heart, in consequence of a large portion of the respiratory organs becoming, in a great measure, inefficient for the purpose of aerating that fluid, they gradually diminished as the circulatory and respiratory organs became slowly adjusted to each other. No *accumulation* of air occurred, or, while the openings continued unobstructed, could occur in the pleura. The side was not dilated; the heart was not displaced; the liver was not protruded; the operation of paracentesis would necessarily have been useless. The man, indeed, was generally able to walk about the ward, and converse with his fellow-patients, and sank at length more from the effects of phthisis than of pneumo-thorax.

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In the preceding pages I have said scarcely anything in reference to the treatment of pneumo-thorax, as I believe that no plan of treatment can be recommended as even generally applicable to the constantly varying and variable conditions under which the disease appears. Each case must be separately studied; the symptoms of each individual must be viewed in connection with the previous history and the physical signs; and the indications presented by each must be met by means appropriated, not to the name of the complaint, but to the actual condition of the patient at the time. In one case the disease may be accompanied with acute pleurisy, and local bleeding or even venesection may be required; in another, the most powerfully diffusible stimulants may be imperatively demanded, to prevent

exhaustion and death. In some instances accompanied with a large accumulation of gas or fluid effusion, paracentesis may be advisable, for the purpose of affording at least temporary relief; in others, the operation will not be attended with the slightest momentary advantage; it will be worse than useless. I have therefore thought it better to pass by the question of treatment almost entirely, rather than to introduce that which might possibly lead to error. In all cases it may be, however, observed, that perfect quiet and rest are most important remedial measures.

I have not entered into a consideration of the possibly remedial tendency of pneumo-thorax and empyema in some cases of advanced phthisis, in which little disease exists upon the opposite side, as I have desired that my statements should be as free as may be from mere hypothesis, and be regarded as (what, indeed, they really are) the pure results of observation. I am, moreover, not aware that I am able with advantage to add anything to the remarks already published upon this matter by Drs. Houghton, Stokes, Barlow, and myself. I cannot, however, allow this opportunity to pass without a brief allusion to this very interesting question, and without referring to the very marked improvement that has sometimes taken place, after the immediate effects of the accidental rupture have subsided, in the symptoms and comfort of persons in the latter stages of consumption, in whom pneumo-thorax has supervened. Hectic fever, previously common, has been observed to cease; the cough, before frequent, manifestly to decrease, if not entirely to disappear; and the expectoration, which had been abundant, to be so much reduced as to be scarcely observable. These consequences of the accident cannot, indeed, be deemed wonderful, when it is recollected that an organ in a state of active disease, and perhaps of inflammation, containing abscesses with large secreting surfaces, is, by the pressure of the gas upon its exterior, so collapsed as to be rendered inactive; that little or no air enters its vesicles, and that the blood permeating its vessels is reduced almost to a minimum; that the diseased



organ becomes quiescent, and the whole function of respiration is carried on by one which is comparatively healthy. I think, indeed, that there can be little doubt that, in some few instances, life has been prolonged by the occurrence of this accident, though it has been regarded as a speedily fatal a complication to phthisis by some of the French pathologists.

Scarcely anything has, in the preceding pages, been said in reference to prognosis, and nothing respecting the curability of the affection, as I believe we are not at present in possession of any facts amounting to a *proof* that it has ever been cured, or, indeed, that it is really susceptible of cure. Dr. Houghton has, as it appears to me, with great propriety, briefly alluded to its curability. There seems, indeed, nothing in the nature of the disease itself which renders it unsusceptible of cure. There is nothing, with which I am acquainted, in morbid anatomy or pathology, which is opposed to the possibility or even the probability of such an occurrence. If, for example, in the cases of Dr. Townsend and Andral, or even in cases III., IV., and X. in this paper, simple pleurisy had followed, and by the effusion of plastic lymph had sealed up the aperture; if, by perfect rest, this lymph had subsequently become organised, and adherent to the costal pleura, and a permanent barrier had thus been formed against the farther ingress of air to the serous membrane; as it is known by experiments upon the lower animals that gases may be absorbed from these membranes, and it is a matter of almost daily observation that fluid effusions are thence absorbed, there does not appear any reason to doubt that it is at least within the range of a not very remote probability, that the pneumo-thorax might have been removed, and the disease thus far absolutely cured. Cases, indeed, sometimes occur, which, to the attendants, seem to indicate that such a process has actually taken place. But in such cases, as in phthisis, when recovery is established, though there be no dispute as to the previous existence of disease, and of extensive disease in the lung, doubts will be expressed by readers or auditors, and will occasionally occur to the minds

of the observers themselves, whether that disease was really phthisis in the one case, or pneumo-thorax in the other. An instance of this recently occurred to myself. A young married lady, several of whose brothers and sisters had died of phthisis, and who had herself for some months been in delicate health, was after an abortion attacked with severe febrile symptoms, accompanied with relaxation of the bowels, by which she was much reduced. She had not been previously troubled with cough, nor had she ever suffered from hæmoptysis, and her chest had been pronounced by more than one examiner, free from disease. Her attendant during the attack under consideration thought differently, and I was requested to see her with him in consultation. I found her much exhausted; she had recently passed large quantities of sanguineous fluid, mixed with alimentary matters, from the bowels; her features were contracted, and her eyes sunken; copious perspirations existed on the face, and she had a clammy state of the surface; the respirations were 45, and pulse 140 to 160 in the minute, and so feeble as scarcely to be felt. She had no cough, nor had she suffered from any; and, though her respirations were so frequent, her voice was tolerably firm and steady. In this condition a minute exploration of the chest could not of course be made, and would not have been justifiable; but as I knew that its condition was a source of great anxiety, and that my opinion would be requested thereon, I made such examination as the state of the patient permitted. I found the left side free from abnormal signs, and the right tolerably resonant on percussion, except at the lower and posterior part. This side was but slightly moved upon inspiration; and the respiration was hoarse below the clavicle. Posteriorly and inferiorly the breathing was tubular and fistulous, and the voice so shrill as to approach to metallic resonance. Such alone were the facts which I was then able to collect. She was ordered opiate enemata, and large doses of acetate of lead and opium, with such occasional stimulants and fluid nutritious diet as she was able to take. The next day she was in some respects better, as the dysenteric diarrhoea had been



much moderated; but on the following day she was still lower than before. Her exhaustion was now extreme; her respirations 60, and her pulse as nearly as it could be counted 160. She appeared, indeed, almost beyond a justifiable hope of recovery, but was ordered large doses of ammonia and opium, with mucilage, and infusion of serpentary or cusparia, every three hours; to have the enemata administered if required, and to take brandy and water and nourishment frequently. By these means, together with perfect quiet and excellent nursing, to the great surprise of her friends, and the still greater surprise of her medical attendants, she began slowly to recover. The affection of the bowels was no longer troublesome; but as there could be no doubt whatever of the existence of serious and extensive mischief in her chest, her ultimate recovery was considered and stated to be exceedingly problematical. As to the exact nature of that disease, the considerations of her belonging to a phthisical family; of her having been previously examined, and stated to be free from thoracic affection; of her never having suffered from cough, or, to her recollection, from pain of the affected side; together with the exceedingly rapid breathing and extreme collapse, perhaps caused by the serious drain on her system taking place by the bowels, led me to suppose that the complaint in the chest was pneumo-thorax. I did not visit her again for about two weeks, when she had much improved, and the dysenteric affection had long ceased. The pulse was still 140, very small and feeble, and the respirations 40 in the minute; the skin soft and clammy, and the features pinched, though the expression of countenance had much altered for the better. On exploring the chest I still found the left side free from the evidences of disease. The right was almost motionless upon inspiration; it was generally not dull upon percussion, and anteriorly was rather more resonant than natural, except below the clavicle. It was destitute of pure respiratory murmur in every part. Tubular breathing existed anteriorly, even below the clavicle, and over the scapula posteriorly; while below that bone the breathing was de-

cidedly fistulous, and the voice shrill and metallic. Hippocratic succussion was not present. She has for the last three months been very slowly, but, with one brief exception, gradually improving in health and strength, and she is now able to walk out, to join her family circle, and to engage in the lighter domestic duties of her establishment without inconvenience. I have not examined her chest, nor seen her in a medical capacity, since the occasion last referred to; I am therefore unable to make any report upon the present state of the lungs and circulation, though I was informed by her medical attendant that for some weeks, or even months, the pulse had continued exceedingly feeble, small, and rapid. The facts of her case, so far as they are here related, are those that I myself observed. I am unable to account for them, excepting upon the supposition of the thoracic affection having been pneumo-thorax, and of its being either cured, or so much reduced in amount as to be comparatively harmless.

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CONCLUSIONS. — From what has been stated in the preceding pages, and for the most part illustrated by the cases therein related, the following conclusions may, I think, be fairly derived:—

1. That pneumo-thorax is often not so speedily fatal as has been represented, especially by the French pathologists.

2. That the decomposition during life of effused fluids, and gaseous exhalations from the pleura, are, to say the least, doubtful causes of pneumo-thorax.

3. That pneumo-thorax has not been proved to arise from other causes than a communication of the pleura with the external air.

4. That the most frequent causes of pneumo-thorax are phthisis, empyema, and gangrene of the lung, in the order in which they are mentioned; and that, independently of external violence, pneumo-thorax from other causes is extremely rare.

5. That pneumo-thorax occurs as a consequence of phthisis, with a very small cavity, or without any cavity, existing in the lung.



6. That according to the records at present possessed, pneumo-thorax is more frequent in males than females ; and the right side of the chest is rather more frequently affected than the left.

7. That urgent dyspnœa and great prostration do not necessarily accompany the accession of pneumo-thorax.

8. That pneumo-thorax may take place without the occurrence of any symptoms by which the period of the accident can be positively determined.

9. That tympanitic resonance on percussion, and absence of respiration, are not pathognomic of pneumo-thorax, as these physical signs may exist without pneumo-thorax, and pneumo-thorax may exist without these signs.

10. That pneumo-thorax is generally easily recognized by physical signs, but that even with their assistance the diagnosis is sometimes difficult and uncertain.

11. That the absence of the symptoms which usually supervene upon the occurrence of pneumo-thorax, and of the physical signs which generally accompany it, is probably dependent upon the presence of a considerable amount of disease existing in the lung, upon extensive pleuritic adhesions, or upon the two combined.

12. That the greater the amount of disease in the lung, and the more extensive the adhesions of the affected side, the less marked are probably the symptoms of the attack,

and the less characteristic are the physical signs of the disease.

13. That enlargement of the side, displacement of the heart, and protrusion of the liver, are not necessary accompaniments of pneumo-thorax.

14. That the preceding symptoms, when present, are probably dependent upon the opening into the pleura being of small size, or being obstructed, or upon fluid effusion, as they do not usually occur in simple pneumo-thorax when the opening is large or free from partial occlusion, or when the fluid effusion is not considerable.

15. That the operation of paracentesis is not to be recommended in pneumo-thorax, except for the purpose of relieving urgent symptoms, arising from the accumulation of gas, or of removing the fluid effusion which accompanies it.

16. That the general treatment of pneumo-thorax must depend upon the symptoms presented by the individual case, but that in all cases, and under all circumstances, perfect rest is likely to be attended with advantage.

17. That it is probable that the supervention of pneumo-thorax in some cases of advanced phthisis has tended to the prolongation of life.

18. That there is no valid reason for believing that pneumo-thorax is unsusceptible of cure, and that it is therefore necessarily incurable.

